Surgery, Gynecology and Obstetrics

An International Journal
Published Monthly

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Volume IV
January-June, 1907

PUBLISHED BY THE
SURGICAL PUBLISHING COMPANY OF CHICAGO
103 STATE STREET, CHICAGO
1907

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1907

SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME IV JANUARY, 1907 NUMBER 1

BETTINA HOSPITAL, VIENNA, AUSTRIA

Prof. E. Wertheim, Gynecologist-in-Chief

THE RADICAL ABDOMINAL OPERATION IN CARCINOMA OF THE CERVIX UTERI[1]

BY PROF. E. WERTHEIM, VIENNA, AUSTRIA

THE honor of addressing this combined meeting of the Medical and Gynecological Societies of Chicago I well know how to appreciate. I have accepted your invitation with all the more pleasure as it has for a long time been my desire to visit the country in which I have so many friends and pupils. Moreover, the discussion of the proposed subject attracts me especially, for it concerns a field in which the Americans and Germans have distinguished themselves, and through work done in common have attained a preeminence. If to the vaginal uterine extirpation the name "German operation" is applied, the radical abdominal operation can with equal justice be characterized as the "German-American operation."

From experience that vaginal uterine extirpation, even when restricted to so-called incipient cases of cervical carcinoma, resulted only in a minimum number of permanent results, conclusions were first drawn in America and Germany, and always with renewed enthusiasm, leading to the return to the abdominal operation in spite of its then prevailing high mortality.

Of the Germans, above all, W. A. Freund, the great originator of the abdominal route for uterine extirpation, is to be named, who indefatigably strove to establish this operation as a special carcinoma operation. Then are to be named Freund's pupils, Funke and Ries, the latter having first advocated the systematic removal of the regional lymphatics. Then Veit, Rumpf, and Küstner are also to be mentioned.

Of Americans, in the first place stands Howard Kelly, who first practised the introduction of bougies for the recognition of the ureters, and Clark, Cullen, Pryor, and Werder.

What other nations have rendered in the way of pioneer work attaches itself principally to the names of Jacobs (Belgium), Ricard and Reynier (France).

If, in spite of all attempts made by such prominent men, this abdominal operation in cases of carcinoma uteri colli could not be established as a valuable one, the chief reason must lie in the fact that these attempts were not executed with the necessary perseverance. The difficulties which this operation presented forced many either to abandon it soon, or, in order to mitigate the dangers of the operation, so much of its essential radicalism was sacrificed as to make the permanent results no better than those of the vaginal uterine extirpation.

Such was the condition of affairs when I turned my attention to this subject in 1898. Only by preliminary exposure of the ureters

[1] Read before the joint meeting of the Chicago Medical and Gynecological Societies, October 10, 1906. For discussion, see Transactions, *post*.

Fig. 1.

— and this much was evident to me — could a thorough and effective extension of the abdominal operation be attained. Were these exposed, however, extensive areas of parametrium and lymphatic glands could be removed with the uterus — the difficulties arising thereby from hemorrhage and the possibility of infection could surely be overcome.

Naturally, I approached this subject with great caution. The foundations at that time were rather vacillating, and aside from the meager publications of the above-named authors, consisted only of a few occasional experiences previously acquired by myself. If I, as follows, picture the various phases which I practise in my operating methods, I must consequently desist from describing the development of the same in all their details. That in the course of time various modifications should present themselves, lies in the nature of the same. From the original radicalism, however, nothing was abandoned; on the contrary, the opposite rather prevailed.

The technique of the operation is as follows: After a careful preliminary treatment of the cancer per vaginam by scraping and burning it with Paquelin's cautery, and after a thorough disinfection, the patient is placed in Trendelenburg's position, and the abdominal cavity opened by a median longitudinal incision between the symphysis pubis and umbilicus.

1. By dividing the posterior layer of the broad ligament, the ureters which appear through the peritoneum are exposed up to their entrance into the parametrium. It is necessary to avoid isolating them all around, and their surrounding vascular network must be spared as much as possible (Fickel, Sampson). (Fig. 1.)

2. After dividing the peritoneum, the bladder must be separated from the uterus. (Fig. 2.)

3. Then follows the ligation and division of the infundibulo-pelvic, the broad and round ligaments. The order in which these first three steps follow one another may be varied. (Figs. 3, 4.)

Fig. 2.

4. The next step is the ligation and division of the uterine vessels with the surrounding cellular tissue. For this purpose the following manipulation serves: The index finger of one hand is pushed along the ureter through the parametrium towards the bladder until the tip of the finger appears there; the vessels are then raised on the finger which covers the ureter, so that the ligation and division of the vessels can take place without injury to the ureter. The bleeding from the uterine ends of the vessels is stopped by clamps or ligatures. (Figs. 5, 6.)

5. As soon as the uterine vessels are divided, the vesical portion of the ureters has become easily accessible and the preparation of the ureters can be readily completed. In simpler cases the vesical end of the ureter separates without any difficulty, partly by using the blunt end of the finger, partly with a few strokes of the scissors, up to its ending in the bladder, and the bladder itself is separated in its deeper part from the tumor and the vagina. If the ureter is fixed, the advantage of the abdominal route is most apparent, as by careful preparation one can separate even firmly fixed ureters from the tumor without any danger to them. (Fig. 7.)

Fig. 3.

Fig. 4.

6. Next follows the separation of the rectum from the vagina. The isolation of the carcinomatous organ has now been sufficiently effected, and its removal follows. (Fig. 8.)

7. For this purpose, the parametrium is divided as closely as possible to the pelvic wall (Figs. 9, 10); and

8. The vagina is cut across. The seventh step can be carried out without any loss of blood by applying to the parametrium, before dividing it, four or five bent clamps, on each side, which can be replaced later by ligatures. Before the eighth step is begun, the vagina is cleaned out again by dry-wiping with sterile gauze. To avoid infection from the cancer, strong clamps are applied to the vagina before

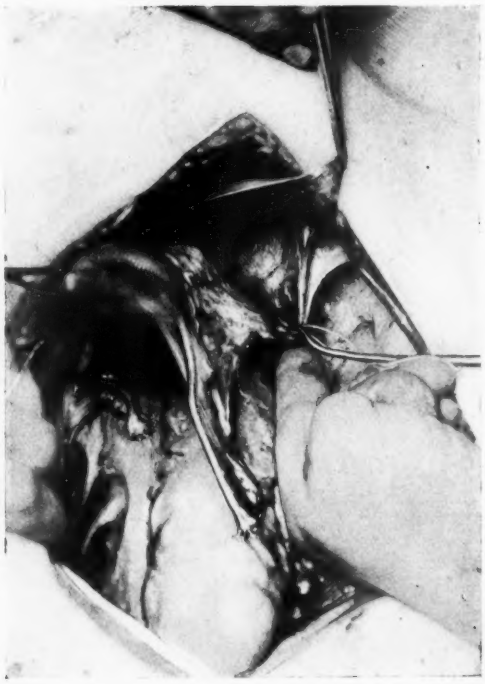

Fig. 5.

its division, so as to isolate the cancer from the vagina, which is divided below these clamps. Bleeding from the paravaginal tissue is stopped by stitching round the vaginal stump. The division of the vagina after the preceding application of such clamps is preferable to the procedure at first adopted — namely, extracting the uterus through the vagina, having first loosened it all around — on account of the more effectual control of bleeding by the former method. (Figs. 11, 12, 13.)

9. For the purpose of extirpating the lymphatic glands in the neighborhood, it is necessary to prolong the incision of the peritoneum upwards. The great iliac vessels are, as a rule, already bare; if not, a blunt division of the cellular tissue with the finger suffices. Every lymphatic gland at all enlarged in the region of these vessels, up to where the aorta divides and downwards as far as the obturator foramen, must be extirpated. Careful checking of bleeding must be undertaken here also.

10. The wound must be treated as follows: The cavity created by the removal of the tumor is filled in loosely with iodoform-gauze, which extends to the vulva. An exact closing of the peritoneal cavity over this gauze drainage is effected by the sewing up of the anterior and the posterior flaps of the peritoneum. The final step is suture of the abdominal incision in layers.

The after-treatment is relatively simple. The strips of iodoform-gauze are removed in from five to ten days, successively. By obtaining primary union of the wound we allow the patients operated upon to get up on the fifteenth day after the operation. The greatest care has to be bestowed on the bladder, which is in most cases more or less paralyzed, and must therefore be emptied by the catheter at regular intervals, besides methodical washing out with a three-per-cent solution of boric acid or other suitable solution. The bladder usually recovers its functions when the patient gets up.

Fig. 6.

In some cases, after the lapse of the first few days uretero-vaginal fistulæ develop, through secondary necrosis of the ureter. Sometimes they close again of themselves, after cauterization with iodine or copper sulphate, but in other cases nephrectomy must be performed later — a proceeding which we prefer in these cases to the reimplantation of the ureters into the bladder, because the fistulous ureter is imbedded in the cicatrix. The nephrectomy was very well borne in the three cases in which it was necessary. The more, however, we mastered the technique, the less seldom did necrosis of the ureter occur, and only once in the last fifty cases.

In this respect, it is important, when freeing the ureters, to avoid, as far as possible, completely raising them and injuring the uretero-vaginal vascular network (see publication of Sampson at Howard Kelly's clinic).

According to the plan of operation and after-treatment stated, from the autumn of 1898 up to the present, 345 cases have been treated.

Fig. 7.

Fig. 8.

The duration of the operation was at first from two to two and one half hours; now, for easier cases, it is only one hour, and in more difficult cases, one hour and a quarter. For a long time we could not reduce the mortality below 15 to 18 per cent; the cause of death was only rarely attributable to infection and peritonitis, and in only a few cases it was due to pyelitis, which supervened after necrosis of the ureter. The great majority of deaths were the so-called heart deaths. The end occurred within the first twenty-four or forty-eight hours, from a kind of collapse, without a trace of infection or peritonitis. A thorough change in this respect first occurred when we set about administering the anæsthetic after the preliminary preparation for the operation (scraping and cauterizing the cancer by Paquelin's cautery and disinfection). By this means we save half an hour of anæsthesia. Moreover, for over a year we used, with exceptionally good results, lumbar anæsthesia. We

Fig. 9.

Fig. 10.

use for this purpose stovain with the addition of adrenalin. Even very old cachectic women with badly degenerated hearts bear this operation well by this procedure. In fifteen cases it was necessary only twice to resort to subsequent chloroform anæsthesia. From the shortening or avoidance of narcosis, we have attained an extraordinary improvement in our primary results. Of the last one hundred cases, only eight died as a result of the operation, and of these, by the closest review, only six can be attributed to it. One death occurred from shock following a stomach lavage, and one from a myelitis existing at the time of operation.

This percentage of mortality compares favorably with that of the vaginal carcinoma operation, especially when it is considered how many severe and unfavorable cases there were which, by the vaginal route, could not be approached at all, or only at the expense of a rapidly rising mortality.

As already mentioned, in the beginning our primary results were very poor, and we could not reduce the primary mortality below fifteen to eighteen per cent. If we, in spite of this, did not abandon the operation, but, notwithstanding, pursued it with greater perseverance, it was due to the fact, apart from the consciousness that we were dealing with women who were otherwise nearly all irretrievably doomed, and who hailed with joy any attempt, however dangerous, to afford them relief, that we had reached the positive conviction, after the first few cases, that we were on the right track.

After the first few cases we could discern the technical superiority of our operation. In how exact and neat a manner could even large and infiltrating cancers be detached! How safely, without causing any injury, could closely adherent ureters be separated from the cancerous uterus! Firmly fixed bladders could be separated from the tumor without being opened, and if this was impossible, they could be re-

sected and repaired by careful suturing, and in the same manner resections of the ureters and of the rectum could be done.

Another extraordinary encouragement to persevere in our efforts resulted from the histological examination of the lymphatic glands and parametrium. Here, at last, the opportunity presented itself to receive enlightenment concerning the condition of neighboring tissues in the different stages of uterine cancer.

I might well dwell on the fact that the histological researches carried out by us have become the groundwork in this direction. Fifty thousand sections in series were made and examined by us with the greatest care. In twenty-eight per cent of the cases the regional lymphatic glands were affected with cancer. The cancerous glands were always enlarged, and generally very considerably so; only in a few cases was the enlargement inconsiderable. In the elongated spindle-like glands, which, so to speak, only represent a thickening of the lymphatic ducts, we never found carcinoma.

In a further thirty per cent of the cases the glands were more or less considerably enlarged, but no carcinoma was found in them—only hyperplasia and infiltration. Places of predilection for the appearance of cancerous glands were the regions between the external and internal iliac artery, and the obturator foramen; as a rule, when these glands are removed the obturator nerve is exposed. In the great majority of cases, where diseased glands are found, they are cases of advanced cancer; in only a few of the cases were they present in the early stage.

All these facts have been corroborated later by other operators, who have associated themselves with us in our proceedings—Zweifel, Döderlein, von Rosthorn, Kleinhaus, Krönig, etc.

As through these investigations the foundation was laid for the knowledge of the conditions of the glands in the region of the uterus, in the same way the histological examination of the parametrium showed that in 22.5 per cent of the cases this tissue, though when investigated it was found to be soft and distensible, proved

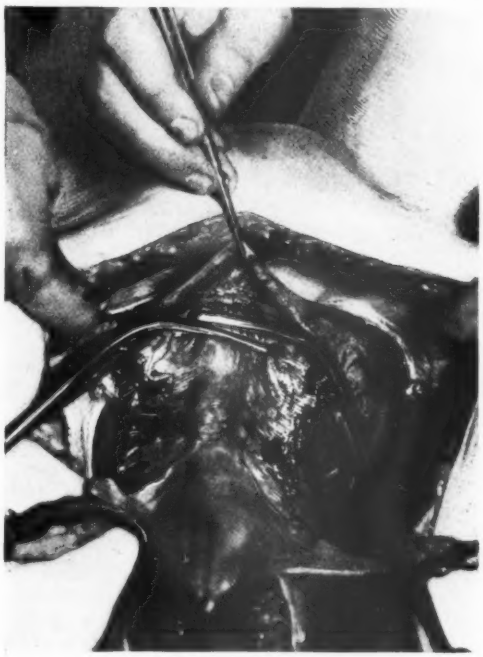

Fig. 11.

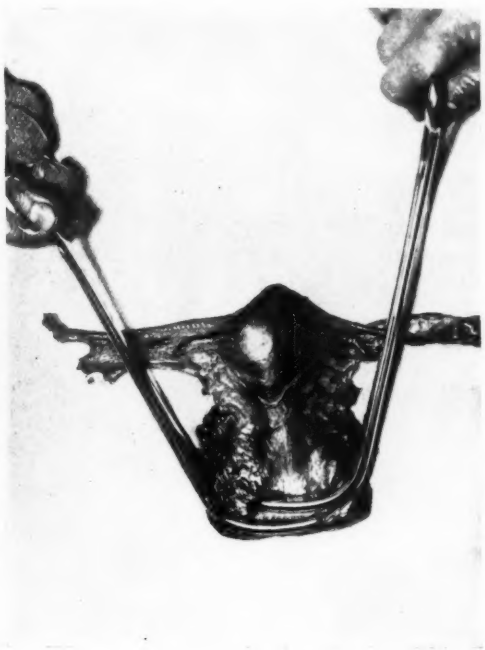

Fig. 12.

Fig. 13.

to be cancerous; on the other hand, in about 14 per cent of all cases, though there was considerable infiltration, no carcinoma could be found.

In answer to the question, In what stage of the disease are the lymphatic glands affected by cancer? it appears from our investigations (*vide* Kundrat) that in ten per cent of the cases, notwithstanding the absence of cancer in the parametrium, the glands were cancerous; and, *vice versa*, in 27.5 per cent, though cancer existed in the parametrium, the glands were free from it. In 40 per cent of the cases the parametrium and lymphatic glands were free from cancer, and in twenty per cent both were affected. These investigations and their results were also corroborated by later authors (Kermauner, Lameris, Kroemer, Baisch, Pankow, etc.).

The most important conclusion derived from these investigations is, that in only forty per cent of the cases can the usual vaginal extirpation of the uterus be considered a radical operation.

You will agree with us that the results of our histological researches, as well as the undoubted technical superiority of our operative measures, were all well calculated to strengthen us in our belief that we were on the right road.

We could naturally only come to a definite and real decision by the determination of the after-results, for which we waited with anxiety and which we registered at regular intervals. In this respect, after two years we were convinced of the certainty that, in spite of the severest objections and our own critical examination, the after-results were superior to those which had been attained by the usual method of vaginal extirpation. Of the recurrences in scar and stump, otherwise so frequent, we say nothing.

Nearly all the recurrences which came under our notice were in the lymphatic glands, and to-day, after eight years of continual activity, the superiority of our after-results has become an absolute certainty.

In order to give you an idea of how we established our permanent results, I need only refer to the fact that up to the present none of the cases have escaped from our observation. We have kept all in evidence, and register them at regular intervals. The cases that die during the period of observation are excluded only after we have assured ourselves that the cause of death stands in no relation to carcinoma, no matter how distant. We also include the cases in which at operation it was already clear that a radical removal of the carcinoma was impossible.

After such exact procedures it is demonstrated that five years after the operation — the usual period of observation in Germany — of all cases operated on for cervical carcinoma, sixty per cent remained free from recurrence — a result, so far as I know, not yet attained by any one else.

These figures, then, are viewed in the proper light only when you consider that we operated on fifty per cent of the cases of cancer that came under our observation, thus exceeding the percentage of cases heretofore considered operable. I do not wish to tire you with comparisons with the various statistical results

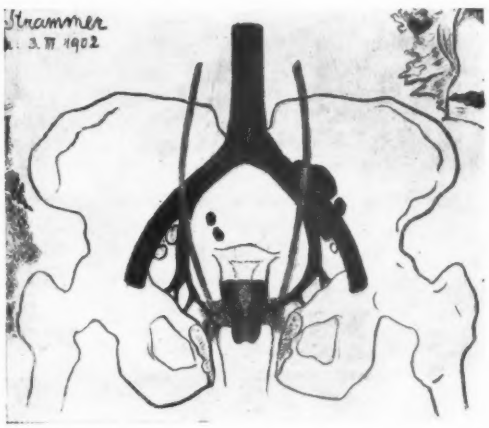

Fig. 14. Showing position and relations of carcinomatous glands in pelvis of Mrs. Frammer, operated upon March 3, 1902. No recurrence.

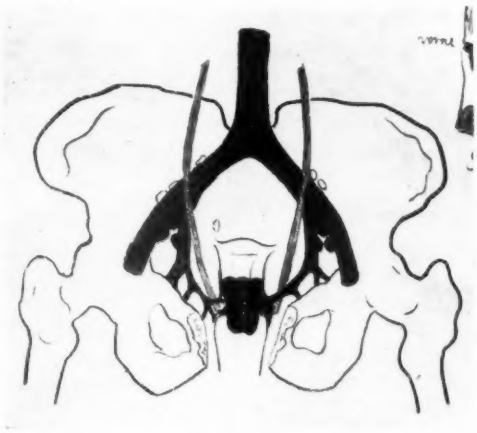

Fig. 15. Showing position and relations of carcinomatous glands in pelvis of Mrs. Goswald. Operated upon February 8, 1902. No recurrence.

of vaginal uterine extirpation. These comparisons are, then, free from objection only when the statistics of vaginal extirpation do not include (as is usually the case) carcinomas of the uterine body, which from their more favorable prognosis permit the permanent results to appear in too favorable a light. Only this much I wish to mention, that formerly only fifteen per cent of relief-seeking cases in Vienna were submitted to operation, and in spite of such selection of favorable cases, only twenty to thirty per cent of those operated on remained free from recurrence. This means that we accomplish about six to eight times as much with our radical abdominal operation as was formerly done in Vienna.

Wherein, now, does the superiority of our results lie? Is it in the removal of the regional lymphatic glands? or is it in the great capability of our operation as regards removal of the diseased uterus?

No decisive opinion can yet be given as to the value of extirpation of glands, but in the majority of cases in which cancerous glands have been removed there has been recurrence of the disease. Some of the cases, however, are free from recurrence after 4 to 4½ years, and I have had some charts prepared to demonstrate them to you. However that may be, it is certain that the superiority of the abdominal operation depends principally, not on extirpation of glands, but on the complete removal of the primary focus, and as much as possible of the parametrial tissues.

Furthermore, it is an error to think that the removal of the regional lymphatic glands adds a considerable difficulty to the operation. Only in places where the lymphatic glands are intimately adherent to the large vessels, especially the veins, is their separation difficult, or perhaps impossible. Indeed, one must not adhere to the view that the removal of the regional lymphatic glands is of value only when it can be thoroughly executed; for this is a

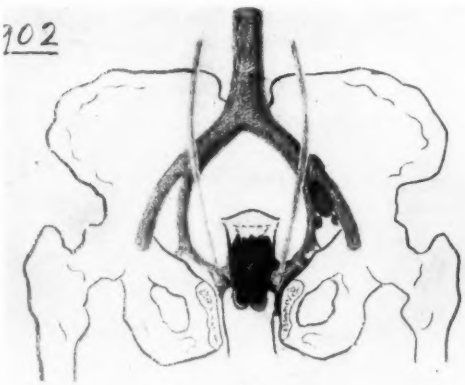

Fig. 16. Position and relations of glands removed from Pick Selma, January 4, 1902. Patient has remained well.

technical impossibility, as well as unnecessary, and I persist, in spite of many opinions to the contrary, in retaining my view, that carcinoma is never contained in lymphatic glands unchanged in size, shape, or consistence.

On reviewing the primary and permanent results attained by me, I feel justified in asserting that the radical abdominal operation has attained a permanent position in the therapy of carcinoma colli uteri. This demonstrates itself, moreover, in the rapid spread of the operation, at least in Germany and Austria. Döderlein, Zweifel, Bumm, Krönig, Menga, Franqué, Rosthorn, and some others are at present scientifically testing this operation, and, as far as can be seen at present, their end-results will also be much better than those attained up to the present by the usual vaginal uterine extirpation.

But, on the other hand, we must not forget that, owing to the great progress made during the last ten years in the technique of vaginal operations, there is at the present time more radicalism practised by this route than was formerly the case.

To-day, even in the vaginal operation we expose the ureters as a preventive measure, and push them out of the way, and, together with the uterus, remove more of the parametrial tissue, especially if we have made sufficient room by extensive incisions after the method of Schuchardt.

Unfortunately, these aspirations, to which Schauta of Vienna has especially devoted himself, are of too recent a date for us to express an opinion. However, this much, at any rate, can now be laid down:

1. That these extensive vaginal operations are more difficult than extensive abdominal ones.

2. That to-day there is no difference in the mortality of the two operations.

3. That, in spite of all skill and technique, the vaginal operation does not permit the removal of as much of the parametrium as the abdominal.

4. That the vaginal operation by no means permits the renewal of the glands which lie on the iliac vessels.

Though we are happy in the conviction that our systematic measures have improved the after-results in cases of cancer of the uterus, yet we cannot conceal from ourselves the fact that our task is by no means completed. We shall obtain entirely satisfactory results only when we have no longer (as has latterly been the case) to face the great majority of our patients in an advanced condition of the disease.

We must endeavor to contrive means by which women who are afflicted with uterine cancer shall seek our aid as early as possible. For this purpose it is necessary on the one hand that women shall definitely understand that they should consult a physician immediately on the earliest manifestations of the disease; and on the other, that physicians and midwives must be again and again reminded of their responsibility by pointing out to them the possibility of the cure of cancer by operation if done in time. Winter of Königsberg has done much in this direction by his well-directed aims in addressing himself to the public, as well as to the midwives, by popular writings. His suggestions seem to have fallen on fertile soil in Austria and Germany, and everywhere else others are following his example; but do not let us suppose that by this means the extensive operation can be dispensed with. There will always be cases where the simple operation of extirpation of the uterus will be insufficient. Many women overcome their dread of operation, and in spite of all admonitions, realize the seriousness of the situation, only when it is almost or indeed quite too late. In other cases, the cancer develops in such an insidious manner that the first symptoms appear relatively late. Only when the radical extent of the operation and its early performance coincide shall we rest thoroughly satisfied with our achievements.

EXCISION OF SCAPULA FOR MALIGNANT GROWTH

By FRANK J. LUTZ, M. D., St. Louis, Missouri

THE classical monograph of J. J. Buchanan of Pittsburg (1) has brought the literature concerning scapular excision up to so recent a date and is so complete that it would be carrying owls to Athens to attempt to rearrange the statistical *data* even to the extent of adding additional cases with a view to formulating rules for our guidance in performing the operation. As von Adelmann (2) has said: "From the descriptions of the manifold operations I am convinced that in each case it must be left to the intelligent operator to formulate a plan of operation according to the circumstances of the individual case and to execute it, *mutatus mutandis*. The unyielding encheireses, as given by different authors, are to be found in the handbooks on operative surgery, and may be applicable in cases of necrosis, but are useful, for the most part, in exercises upon the cadaver." Besides, Picque and Dartigues (3) have presented the operative technique in a thoroughly illustrated monograph.

In calling your attention to this subject today, I had two points in view: 1. To decide authoritatively by your discussion the question, not as yet decided by the recorded cases, whether, in the treatment of malignant disease of the scapula, total extirpation of the bone must be practised in all cases in order to insure a permanent cure; or 2. Whether by a less heroic procedure equally good results can be obtained.

Do you subscribe to the view of Guermonprez (4): "From a therapeutic point of view it is not sufficient to remove the affected portion of bone; the entire bone should be extirpated as if the marrow were affected in its entire extent, and the capsule of the neoplasm were formed by the periosteum"?

The fear that the disease may extend beyond the area which we can touch and see suggests boldness and thoroughness — the two characteristics of true conservatism.

In the next place, I wished to illustrate the result obtained as to the functions of the arm after total extirpation.

The history of the case, for the brief recital of which I ask your indulgence, is the following:

J. T. K., 31 years old, a traveling salesman, single, with no specific history either of the acquired or congenital variety. I saw him first on the 25th of April, 1905. The only trauma to which he might have been subjected could have been produced whilst carrying sample-cases. His attention was directed to the enlargement of his shoulder-blade a week before, because a vest which he had not worn since last summer did not fit comfortably.

Examination disclosed a tumor the size of a cocoanut extending deep into the axilla, without, however, compressing the blood-vessels of that space, for neither was there any other than the physiological difference in the radial pulse of both sides, nor was the venous flow obstructed. The motions of the shoulder-joint were in no wise interfered with. The lower angle of the scapula projected for a distance of about three inches from the thoracic wall. The tumor was smooth, hard, and moved with the scapula, but could not be moved without moving the bone. No glands were involved, and no other tumor was found anywhere upon the body, nor were organic functional disturbances discoverable.

The clinical features of the case made the diagnosis of sarcoma of the scapula practically an easy one; but the treatment presented some perplexing problems, both as to the technique of the operation and also as to the extent to which surgical interference should be had.

I learned from the patient that several opinions had been expressed, declaring the necessity for an interscapulo-thoracic amputation, which, of course, the patient thought of with much fear and the surgeon with much reluctance.

The condition which would make the amputation at the shoulder-joint necessary would depend upon the involvement of the axillary vessels or their sheaths, the axillary glands, or possibly the ribs with which the tumor lay in close contact. If the new growth involved these, then, clearly, the one course open would be amputation; if they were found free, then the excision of the scapula must be considered sufficient.

In order to determine this latter point, namely, the involvement of the structures in the axilla contiguous to the new growth, I made an incision, beginning at the anterior margin of the axillary fold, which exposed the tumor, and

Fig. 1. Weight of arm separating head of humerus from acromial end of clavicle.

Fig. 2. Arm supported.

by traction downwardly and backwardly the axillary space, when, to my great relief, I found that the tumor could be peeled out of the axilla. (Figs. 1 and 2 illustrate the result.)

The tumor grew from the anterior margin of the body of the scapula, and is of the periosteal variety.

The function of the joint, so far as performing the ordinary excursions of the shoulder is concerned, is restored to about one half of what is normal.

The closure of the capsular ligament, after separating it from the neck of the scapula, formed, to a limited extent at least, a substitute for an articular socket.

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SARCOMA OF THE MALE BREAST[1]

Report of a Case

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Synopsis of Case. *Age 25 years; no history of traumatism; mother had both breasts removed for carcinoma. The tumor started in a congenital discoloration of the skin near the right nipple, and in three months had grown to the size of a walnut. The breast and axillary glands were removed; the healing of the wound was perfect. Two months after discharge from the hospital, a keloid was found to have developed in the cicatrix. Eight months after operation, the keloid was smaller, and there was no evidence of recurrence of the sarcoma.*

History. C. C. J., male, aged 25 years, an American, a switchman by occupation, was referred by Dr. Black of Pueblo on February 14, 1906. His mother had both breasts removed for carcinoma, with a two-year interval, by Dr. Harvey Mudd of St. Louis. The previous and personal histories are negative; there has been no traumatism.

For as long as he can remember, the patient has noticed a "black and blue" mark, not a pigmented mole, about 1 cm. in diameter, situated to the right of the right nipple. It had caused him no inconvenience whatever. About three months ago he first noticed that this discolored area was a little larger, laterally, and that at its outer extremity there was a small swelling, about 1 cm. in diameter; it was slightly elevated, hard, freely movable, with no pain or tenderness. Since that time the tumor has grown rapidly, and when examined its dimensions were 5 cm. long, 4 cm. wide, and 2½ cm. high.

During the last month, at the apex of the tumor there has developed an area 2½ cm. in diameter, in which dilated capillaries could be seen; it was at first bright red in color, but has gradually assumed a purplish or plum color. Within the past ten days or two weeks, two spots about ¾ to 1 cm. in diameter have appeared. These are covered by dull red crusts, but after the removal of these crusts, bright red granulation tissue, from the tumor mass, was found to be protruding through perforations in the skin. (Fig. 1.) Palpation shows the tumor to be hard, elastic, painless, attached to the skin and to the pectoralis muscle. It begins 3½ cm. to the right of the right nipple; its long axis is parallel with the anterior axillary fold. The axillary glands were not palpable, and at no time was there pain or tenderness in the swelling.

With the development of the tumor, the black and blue mark had enlarged laterally, extending from the tumor to a point 2½ cm. above and internal to the nipple. This area is hard to describe or picture; its outline is vague and indefinite; its general contour is roughly triangular. (Fig. 1.) At its lateral extremity it is 5 cm. from above downwards; as it extends mesially it gradually diminishes in width till, at its extremity above the nipple, it comes to a point. It is of a mottled bluish black color, more distinct at each extremity than in the middle, and it is traversed from above downward by three dilated veins.

Palpation discloses the presence of numerous small, irregular, indurated areas, and between these the skin is soft, as if there was a lack of subcutaneous tissue. The median extremity of this mottled area is quite dark in color, and is the only tender spot on the chest; there is no spontaneous pain, but this region is quite sensitive to pressure. The patient is well developed and nourished, and has lost no weight during the past six months.

Physical examination failed to reveal any other pathological condition.

DIAGNOSIS

Is the swelling located in the mammary gland or not? was the first question considered in the diagnosis. If outside of the breast proper, it might be due to pathological conditions in the shoulder-joint, the bones entering into this joint, ribs, muscle, fascia, lymphatic glands, or the skin. In the absence of any indications pointing to these structures, and because of the well-recognized irregularity of the boundary of the gland, it was decided that the tumor originated in the mammary gland.

Even a cursory review of the history will eliminate the probability of its being an inflammatory swelling. As it is a neoplasm, the next question is as to its malignancy or its benignancy.

In favor of malignancy there were:

1. The frequency of malignant tumors of the male breast. (While tumors of the male breast are very rare, yet in 25 consecutive cases of this character, 19 were malignant.)

2. The rapid growth, with a previous history of a congenital defect of some sort.

3. The location at the periphery of the gland. (Several instances are reported in which sarcomatous and other tumors have arisen from

[1] Read at meeting of Western Surgical and Gynecological Association, August 31, 1906.

Fig. 1.

sequestered mammary glandular structure in the vicinity of the mammæ.)

4. The attachment to the pectoralis. (This was evident only on attempting to move the tumor in a direction parallel with the fibers of the muscle. The tumor seems freely movable when moved transversely to the fibers.)

5. The attachment to and perforation of the skin.

6. The absence of pain and tenderness.

7. Its smooth, hemispherical contour, and its elasticity.

After deciding in favor of malignancy, the question remains; is it a sarcoma or a carcinoma.

Cancer is much more common (in 25 tumors of the male breast, 16 were carcinoma and 3 sarcoma). The family history was in favor of carcinoma. But the swelling had been painless, there was no regional infection (no enlargement of the axillary glands that could be palpated through the skin), and there was no cachexia. These points, with the age of the patient, and, what is of most importance, the presence of granulation tissue from the tumor mass, presenting through punctures in the non-infiltrated and discolored skin, decided the diagnosis in favor of sarcoma.

Operation. February 15, 1906. At the Denver and Rio Grande Railroad Hospital. The incision is shown in Fig. 2, and was aimed to remove the entire breast and to expose the axillary space. The tumor, the nipple, the discolored area, and 4 cm. of apparently normal tissue were included within the boundaries of the incision. The tumor was found to be adherent to the pectoralis major muscle, and beneath the pectoralis minor there was discovered a chain of lymph-glands extending into the axilla. The superficial structures, the tumor, the pectoral fascia, some of the major muscle, and the chain of lymph-glands with the surrounding fatty tissue were removed.

After the introduction of a large tension suture, a mattress suture of silkworm gut, with pads of gauze between the skin and the suture material, the wound edges were brought together and united with interrupted silkworm stitches. A small drain was inserted at the angle of the wound. (See Fig. 3.) The arm was immobilized by the dressing. The drainage was removed the next day, and the recovery was uneventful.

After the removal of one of the stitches on the seventh day, there was a separation of the wound margins at this point, but healing by granulation rapidly took place.

The patient was discharged three weeks after operation, with the wound entirely closed. The cicatrix was merely a line, except at the point where there had been a separation, at which point the scar was ½ cm. wide. The cicatrix was apparently normal in every respect.

Macroscopical Description of Tumor. The tissue removed at the operation was found to consist of tumor, surrounded by apparently normal skin and fat. The tumor was bisected from its posterior aspect by means of an incision parallel to its long axis. (Fig. 4.) It cut like gristle, was resilient and elastic, and was of a bluish gray or light slate color. It was of uniform consistency, and there were no cysts. After division of the tumor the two hemispheres bulged toward the median line. It was distinctly encapsulated, and the capsule peeled very easily from the tumor at all points. At the site of the punctures in the skin, the skin and the tumor were easily separable, and the tumor itself was

Fig. 2.

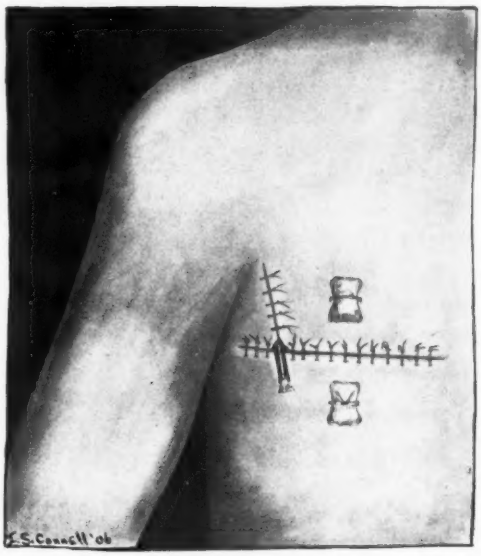

Fig. 3.

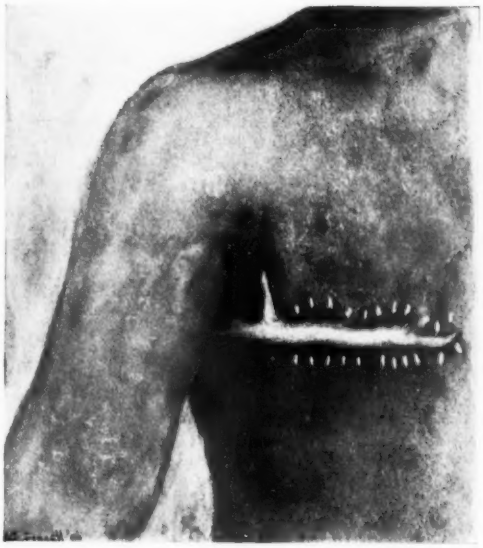

Fig. 5.

red at these spots, due to the presence of granulation tissue. The rest of the tissue seemed normal, except for the discoloration of the skin and the small nodules of thickening. The axillary lymph-glands were enlarged, some being as large as a pea; they were of a dark blue color and were not hard.

Microscopical Description of Tumor. The specimen was examined by W. A. Evans of Chicago, professor of pathology in the Medical Department of the University of Illinois. The tumor itself was a typical small spindle-celled sarcoma. A pure sarcoma, there being no glandular structure; a sarcoma of the non-indigenous variety. The glands showed no sarcoma characteristics. The examination of the skin showed the black and blue mark to be due to a hæmangioma simplex, and the hard nodules to be composed of fibrous tissue.

Fig. 4.

PROGNOSIS

The prognosis is good. Spindle-celled sarcomata are least malignant; but in this particular case the rapid growth in the last few months, before operation, might be an unfavorable sign.

In 91 cases of sarcoma of the breast that were operated upon:

Gross (1) found that 13.18 per cent were cured after four years. As to the time of the recurrence, he found that 57.7 per cent recurred in six months; 28.8 per cent after twelve months; and 8 per cent after two years.

Poulsen (2) says that 42 per cent of those afflicted with soft sarcoma die of recurrence, and only 25 per cent of those who have the hard or cystic varieties. Of his cases, 75 per cent had no recurrence after five years.

Horner (3) found 77 per cent of no recurrence after two years, and 61.5 per cent total recoveries.

Schouler (4) met with 25 per cent recurrence in his cases.

Williams (5), in 14 cases, had recurrence in 21.4 per cent. The period of immunity from recurrence is longer for spindle than for the round celled forms.

Gross (1) states that mammary sarcomata recur locally in 61.5 per cent of all instances, and that sarcoma gives rise to secondary deposits in distant organs in 57.14 per cent.

Subsequent Course. Patient was seen two weeks after his discharge from the hospital. At this time a typical keloid of the cicatrix had developed. In dimensions it was 14 cm. long, 1 cm. at its widest part, and was elevated about 2 mm. above the surface of the surrounding skin. It was widest where the wound margins had separated after the removal of the first stitch, from which it diminished on both sides. (Fig. 5.) The keloid was glistening, shiny, and pale; it was of firm consistency, with rounded margins, and looked as if a streak of melted wax had been allowed to cool on the skin. Some capillaries were visible, extending from the superior and inferior margins of the growth toward the center.

The needle punctures made in suturing the wound margins, except the axillary portion, were also involved, and appeared as prominent white elevated points both above and below the line of union. These small fibrous growths were about 1 mm. wide and 2 mm. long, with their long axis parallel with the long axis of the body; i. e., in a line with the tension on the sutures. But the needle punctures made in introducing the mattress suture, the tension suture, which was tied very tightly over pads of gauze, were not involved in the keloid process. These needle-punctures were normal and invisible.

When seen two months later, May 1st, the keloid was larger; 2 cm. at its widest part and ½ cm. at its narrowest part. Its appearance was about the same, with the exception that it was paler in color. On July 1st the growth was smaller; about 1¼ cm. at its widest point. In other respects it was similar to what it was on May 1st.

There has been, and is, no pain, tenderness, or inconvenience. Patient's general health is good, and there is no sign of recurrence of the sarcoma. The keloid has not been treated in any manner.

REVIEW OF LITERATURE

As to the frequency of cases of this character, the most comprehensive figures are given by W. Roger Williams (5), who found, in 13,824 primary neoplasms of all parts, that 2,422 (17.5 per cent) originated in the breast. As showing the relative frequency of the presence of tumors in the various structures of the body in both sexes, he found the uterus involved in 19.2 per cent and the mammæ in 17.5 per cent. In the male alone, the mammæ is the seat of tumor formation in only .5 per cent; the prostate, with .2 per cent, being the only organ that is less frequently involved. But with the recent increase of literature on cancer of the prostate, one would be inclined to the opinion that the percentage of instances in which the prostate was involved has increased. In the female alone, the uterus is first, with 28.7 per cent, and the mammæ second in 26 per cent.

In an analysis of 2,422 consecutive primary mammary tumors, Williams found 1,974 malignant and 448 benign. Of the malignant, there were 1,879 carcinomata and 95 sarcomata. Of the carcinoma, 1,863 were in the female and 16 in the male. Of the sarcoma, 92 were in the female and 3 in the male. Of the benign, there were 442 in the female and 6 in the male. Both malignant and combined, there were 2,397 in the female and 25 in the male; or in general terms, it might be said that 99 per cent of the breast neoplasms occur in the breast of woman and only 1 per cent in that of man.

Williams has brought out the very pertinent fact that while the relative frequency of cancer and sarcoma of the body in general is 54.5 per cent and 9.4 per cent respectively; of the breast in particular the percentage of carcinomata is higher, 77.7 per cent, and that of the sarcomata is lower, 3.9 per cent; thus presenting evidence in favor of the view that neoplasms are most prone to arise in the sites of greatest post-embryonic developmental activity.

In the breast, Williams found that 95.74 per cent of tumors arose from the archiblast, with only 4.36 per cent arising from the parablast. He considers sarcoma of the breast under the following headings: Adenosarcoma, pure sarcoma, alveolar sarcoma (so called), myxoma, keloid and its allies.

In a table by J. Collins Warren (6), among tumors other than carcinoma is found the division of Ribbert (7), "fibro-epithelial," and with the fibrous type of these is classed the "periductal sarcomata," analogous to the adenosarcomata of Williams; and among the "non-indigenous" tumors, sarcoma is included analogous to the pure sarcoma of Williams.

Many of the earlier reports of so-called sarcoma of the breast cannot be utilized in a study of this condition, because of the loose nomenclature and of the confusion that existed as to the pathology of these tumors Even in that most comprehensive and valuable report

of Schuchardt (8), because most of his material was collected from the earlier literature, the confusion between "Krebs" and "Sarkom" is very much in evidence.

Shields (9) says: "Indeed, any account of these tumors within twenty years is now very devoid of value for purposes of comparative frequency."

Warren (6) says: "Not only has the nomenclature of the diseases of the breast been subject to that continual revision which all medical terms are liable to with advancing knowledge, but in this case national and even local systems have added again to the confusion. The French school, the German, the English, and the American schools of medicine rarely agree in their description of any tumor of the breast, other than carcinoma."

The following instances of sarcoma of the male mammæ have been collected from available literature:

In Schuchardt's (8) first article in 1884, he relates, in more or less detail, 272 cases of tumor of the male breasts, 247 of which are malignant, but only 7 of these malignant growths were sarcomata. They are as follows:

1. JOHN BIRKETT (10). "Sero-cystic Sarcom." 54 years of age. Called by Williams an adenocystic sarcoma.

2. SILVA AMADA. "Kysto-sarcoma, telangiectasico et papillar." This tumor was a recurrence. The swelling had two cavities. One contained blood and granulation. Williams also called this an adenocystic sarcoma.

3. JOHAN MÜLLER. Cysto-sarcoma. 52 years. Extirpated.

4. N. WARD (11). Fibro-spindle-celled. 40 years. Soldier. A nodular tumor the size of a walnut projected from the right mammary region. The overlying skin was purplish, and marked with dilated veins. It was situated above and external to the nipple; it felt firm and elastic. About 22 years ago the patient first noticed a small nodule in the site of the present tumor. Its increase was hardly perceptible until about five years ago. Amputation of the diseased part. On examination after removal, the tumor was found to consist of three nodules, united by dense fibrous tissue, one of which was connected with the mammary gland. On section, the tumor presented a convex, nacreous, fibroid aspect. (The above details are taken from Williams.)

5. SIMON DUPLAY (12). Spindled-celled. Patient noticed a swelling of left breast for a few months. During the last two months it has grown to the size of a hen's egg. It was situated at the outer part of the breast. The skin covering the tumor is a light violet in color, and has dilated blood-vessels. At the tip it is adherent to the skin; it is not adherent to the muscle. It is soft in consistency, and pseudo-fluctuation is present. The axilla is not involved. The tumor was removed under general anæsthesia. On the next day erysipelas set in. There had been no recurrence up to eleven years after the operation.

6. JOHN CROFT (13). Spindle-celled. 52 years. A small swelling had been noticed in the right breast, near the nipple, for over three months. It was in three subdivisions. The middle one was elastic. The overlying skin was adherent, smooth, purple in color, and had many dilated blood-vessels. The upper third was smaller, soft, and fluctuating, and the overlying skin was not infiltrated or adherent, and neither of these was attached to the pectoralis. The lower third was attached to the nipple; was adherent and infiltrated. The axilla was involved. Death followed the operation, on the eighth day.

7. MORTON (14). Spindle-celled. 37 years. Laborer, strong and healthy. Came under observation with a large fungating and eroded tumor of the right breast, of seven years' duration. It was hard, lobulated, circumscribed, and freely movable on the subjacent parts. It was twenty-seven inches in circumference. There was a profuse fœtid discharge, but no regional infection. A history of traumatism was present, and the patient's mother's sister died of a malignant disease of the breast, which recurred twice after removal. The diseased part was amputated. The tumor weighed two pounds after removal. Recovery.

In Schuchardt's (8) second paper are gathered reports of 134 additional cases of neoplasms of the male breast, 101 of which were malignant, and 7 of these were sarcomata. So, with both papers combined, we have 406 tumors, with 348 malignant, but 14 of which were sarcomata.

The cases in the second paper are:

8. VON NUSSBAUM. Adenoid sarcoma. 43 years. Tumor as large as a head in the left breast, which was removed, and was followed by recovery.

9. VON MOSETIG-MOORHOF. Round-celled. 50 to 60 years. A movable tumor the size of a plum, under the nipple, had been noticed for seven months. Removal was followed by rapid healing.

10. GUSTAV SCHADEL. "Sarkom." 20 years. A sarkom the size of a hen's egg in the right mammæ; the axillary glands were not enlarged. Removal was followed by primary union.

11. VON NUSSBAUM. Cysto-sarkom. 54 years. A very large swelling of the left breast. At the base there was a large decubitus. Removal was followed by recovery. Tumor weighed four pounds.

12. ERNST KÜSTER. "Fibro-myxoma-sarcomatodes." 60 years. Dark fluctuating tumor, the size of a fist, in the right breast. Amputation of the breast. Primary union.

13. CREDÉ. "Melanotisches Sarkom." Four years ago an indurated area under the right nipple was noticed. There was some pain, and the axillary glands were

enlarged. Two years ago, the tumor was as large as a cherry, hard, and adherent to the pectoralis. The swelling was then removed and the axilla cleaned out. Primary union. One year ago some glands were removed with their adherent fascia. Primary healing again. In the first part of the year of the report, a swelling the size of a hen's egg, in the scar of the former operation, was removed with a wide margin of apparently normal tissue. This wound healed by granulation; but by the end of the year three "knots" had formed in the scar. These were removed. The diagnosis was the same as before. The axilla was free, and the general condition was good.

14. STUDSGAARD. "Fascicellulare." 43 years. Tumor the size of a hazelnut, in the neighborhood of the right nipple. It was a recurrence after the removal of an older tumor, from the same location, three years before. The axilla was cleaned out this time. The patient was discharged in two weeks.

Gross (1) mentions the following three instances that were not included in the collection of Schuchardt:

15. DUPLAY. Round-celled. The patient was free from recurrence six years after the operation.

16. BOURDILLAT. Has recorded an example of a spindle-celled sarcoma.

17. DAWSON. Spindle-celled. A recurrent growth. This tumor was examined by S. W. Gross himself.

Two additional cases are detailed by Williams (5):

18. HALSAM (15). Lympho-sarcoma. 48 years. One week previously, first noticed a small, hard lump in his left breast, just above and internal to the nipple. It increased rapidly. No previous injury or other known cause. Father died of "cerebral tumor." On examination, a hard, elastic, elongated, nodular tumor was found; this was freely movable under the skin and over the pectoral muscle. There was no retraction of the nipple, and the axillary glands were normal. A fortnight later the breast was amputated. The tumor was inclosed in a thick capsule, and on section it was found to be composed of solid substance containing a few small cysts. The patient was convalescent in about three weeks.

19. BANKS. Round-celled. 21 years. Eight months previously, first noticed a mobile lump, the size of a horse-bean, external to the left nipple, over the edge of the pectoralis muscle. This subsequently increased in size, and the axillary glands became enlarged. The diseased part was excised and the axilla cleared. Five months later there was a recurrence high up in the axilla, and in the glands of the root of the neck and in the mammary region. The disease spread with terrible rapidity. Secondary incomplete operation was performed. Death six weeks later. At necropsy, secondary growths were found in both lungs. In commenting upon this case, Shields (9) says: "It appeared to originate either in a gland below the muscle or in an accessory mammæ. It can, however, hardly be considered as an instance of sarcoma of the breast proper."

20. WILLIAMS (5). Also refers to the alveolar sarcoma reported by Rothman.

In Shields's (9) book the following instances are mentioned:

21. LAURENCE. "Chloroma." 35 years. The tumor and the secondary deposits in the axilla and viscera were a deep green color. The subcutaneous tissue and pleura were also of a grass-green hue. This Shields considers as a unique case in the diseases of the breast.

Shields mentions a specimen in the museum of St. Bartholomew's Hospital. A round-celled sarcoma of the breast in a boy ten years of age. The patient also had orbital growths and tumors of the skull, all being of a bright green color.

22. KEETLEY. Reports an "adenoma" in which it was suspected that some softer parts had taken on a sarcomatous change. The patient, aged 34 years, had noticed the growth twelve years before. It long remained no larger than a bean or nut, but in twelve months grew much faster, until it reached the size of a hen's egg.

23. SHIELDS (9) recites a case from the Pathological Society Transactions, which was pronounced by Mr. Hutchinson to be a "fibro-nucleated tumor." A soldier, aged 48 years, had a tumor the size of a walnut, close to the right nipple. It commenced as small as a pea, twenty-one years before. It was dense, but resilient, and pinkish, being covered with dilated veins, and not adherent to the tissues beneath.

24. NATHAN JACOBSON (16) reports three cases of tumors of the male breast, one of which was a sarcoma. Large, spindle-celled. 73 years, widower, laborer, but for the last few years had not worked. Family had personal histories negative. He was unable to state definitely the time of the onset of the symptoms. In January, 1891, he found an irregular nodulated tumor of the right breast adherent to the skin, but still movable below, with glandular involvement of the axilla. The tumor was about four inches long and three inches wide. General health of the patient was unimpaired. The blood-vessels were somewhat atheromatous. The tumor, the breast, and an area of normal tissue were removed, and the axilla was cleaned out. Patient made an uneventful recovery. One year later, a small growth was present in the axilla. A second operation was advised, but the patient refused. The gland slowly increased in size, and new points of infection appeared in the armpit. More than three years after the operation, Jacobson again saw the patient. He then desired an operation, but the growth had become inoperable. Death followed four years after the operation. This was thought to be scirrhus of the breast until the pathologist reported a large, spindle-celled sarcoma. The slow course of the disease after opera-

tion seemed to Jacobson to confirm furthermore this view.

25. WILLARD J. STONE (17), in a study of "The Surgical Pathology of One Hundred Mammary Tumors," found one sarcoma in the male. In a personal communication, Dr. Stone informed me that this tumor was removed by Dr. Senn, at his clinic in Rush Medical College, in May, 1904. The patient was a young man about 25 years, with a slow growing mass involving the entire gland. Microscopic examination showed the tumor to be a "large spindle-celled rhabdomyosarcoma."

26. M. RICHARDSON (18), in a plea for the early removal of all tumors, cites the following: Round-celled. 35 years. First seen by Dr. Richardson in December, 1898, for a painless tumor in the pectoral border of the left axilla. First noticed it two years ago, since which it has increased a trifle in size. The tumor was freely movable under a non-adherent skin, and, though rather hard, suggested a lipoma. Removal of the tumor was advised, but it was not urged. On October 31, 1900, nearly two years after the first examination, the patient asked to have the tumor removed, because it had grown so large as to be in the way. Examination revealed a large, somewhat irregular tumor filling a considerable portion of the axilla, and extending toward the clavicle. It had lost the appearance suggestive of a lipoma. The rapidity of growth and the irregularity of outline suggested strongly a sarcoma. Microscopical examination subsequently proved this to be correct. Complete extirpation was attempted, but the result of the dissection was unsatisfactory. Recovery from the operation was rapid. One year later there was a large recurrence, filling the axilla. Loss of taste and smell suggested the possibility of cerebral metastasis. A second operation was incomplete. Amputation of the entire extremity was suggested, but refused. The patient was then sent to Dr. Coley, who, by means of his toxine treatment and the X-ray, was able to show, before the American Surgical Association, in 1903, this patient entirely cured.

27. AUTHOR'S CASE. Spindle-celled. 25 years. A congenital defect, an angioma, in which a tumor has appeared within the last three months, and within the last ten days the overlying skin has become attached and perforated. Complete extirpation. Recovery. Keloid developed in the scar.

28, 29, 30. WILLIAMS (5), in his statistical tables, mentions three cases of sarcoma of the breast in the male, but in the text relative to this phase of the subject these cases are not mentioned.

Shields (9) relates the following instances, in which sarcomatous growths originated in the skin over the male breast:

31. KEETLEY. Spindle-celled. 55 years. A growth of several years' duration, the size of an orange, red and weeping. It seemed to grow from the skin above the nipple, and the main bulk of the tumor was above the skin.

32. BUTLIN. Fungating melanotic sarcoma of the skin. 40 years. The patient found that the skin over the breast was bluish in color, and that it "itched very much." Finally, ulceration was observed. The axillary and supraclavicular glands became enlarged, and some bluish nodules appeared in the skin near the umbilicus.

34. POLLOCK. The microscopic characters of the tumor were not given, but the similarity to melanosis is very striking. A plasterer, aged 30 years, had a mole on the right breast, near the nipple, all his life. Lately he had pulled it about and made it bleed. It then became larger and would not heal. It is as large as a small orange, and composed of exuberant granulations, but freely movable on the skin below.

The analysis of the above cases shows the following results. In 20 cases the age was mentioned:

20–25	4	45–50	1
30–35	3	50–55	5
35–40	2	55–60	1
40–45	3	73	1

Axillary involvement is mentioned as being present in nine cases, and as absent in four cases.

The tumor was found *adherent* to the skin in five cases; to the tissues below in three cases; and mention of no adherence was made in seven instances.

The *size* as given by the various authors is as follows: A pea; cherry; hazelnut; "small hard lump"; horse-bean; walnut; 5 x 4 x 2½ cm.; plum. In four instances the size is given as that of a hen's egg. An orange; fist; 4 x 3 inches; 27 inches in circumference; tumor weighed 4 pounds; and one tumor was the size of a "head."

The *location* is given as right breast in eleven instances, and in the left breast six times. With relation to the nipple, as follows:

Above and external	5	Near nipple	4
Above and internal	1	Under nipple	2

The growth when first seen was a recurrence in three instances. In the others the *duration* was: 1 week; "a few months" in three instances; 7 months; 8 months; 1 year; 4 years in two instances; 5 years; and 7 years.

In two instances, malignant disease of the breast occurs in the *family history*, in one of which both the sister and the mother died of malignant breast tumor, and in the second (author's case) the mother had both breasts removed for carcinoma.

In only one instance is *trauma* mentioned in the history. The form of trauma was not mentioned. This was in the same case in which mother and sister had breast tumors.

The tumor apparently *originated* from congenital defect or benign tumor as follows: Area of dilated blood-vessels; mole. From a nodule of twenty-two years' standing; an adenoma, a fibroma, and a lipoma.

In only nine cases was there an adequate *description* of the tumor. The most characteristic feature was the discoloration of the skin (purple, violet, pinkish, bluish, plum color, reddish), with the dilatation of blood-vessels; and in later cases, puncture of the skin, with presentation of granulation tissue.

As to the *variety* of the tumor:

Spindle-celled	12	Cystic	3
Round-celled	7	Melanotic	3
Chloroma	1		

The results were:

Recoveries	11
Recovery after fourth operation in two years	1
Recovery with development of keloid	1
Recovery with development of erysipleas on second day, no recurrence after eleven years	1
Recovery with inoperable recurrence; after one year; Coley treatment, recovery	1
Deaths	3
Death after second operation within five months	1

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ALLGEMEINES KRANKENHAUS, HAMBURG-EPPENDORF

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MODERN SURGERY OF THE KIDNEY[1]

THE ACHIEVEMENTS OF MODERN SURGERY OF THE KIDNEY FROM THE STANDPOINT OF DIAGNOSIS AND THERAPEUTICS

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TRANSLATED BY PAUL F. MORF, M.D.

DURING recent years a complete change has taken place in our knowledge and understanding of the problems of kidney surgery. Where, formerly, complete reliance had to be placed on skillful inspection, the sensitive palpating hand, and on the results of urine examination, contemporary surgery of the kidney has been able, as has no other science, to utilize the physical and technical accomplishments of modern times. It is no longer necessary to perform serious preliminary operations, such as cystotomy or laparotomy, in order to ascertain the presence of a second kidney — procedures which, at best, did not give us any idea of the functionating power of the organ laid bare by operation. By means of well-established scientific methods, the surgeon of to-day can determine whether or not a second organ is present and able to do the work of the organ to be removed in addition to its own. With a comforting feeling of security, he may now undertake the removal of the diseased organ, after having made the diagnosis, and need have no fear of any insufficiency of the remaining organ. While in former years we experienced one fatal outcome in six cases of extirpation of the kidney on account of absence or insufficiency of the other organ, we have not had a single death among 148 nephrectomies where an accurate application was made of the newer diagnostic helps, notwithstanding the fact that in several instances the remaining organ was itself not perfectly healthy, however, as was shown previous to operating, capable of performing its own function and taking upon itself the work of the extirpated organ.

For its pre-eminence, modern surgery of the kidney depends on the X-ray tube, the cystoscope, the ureteral catheter, and on the methods of functional examination, notably cryoscopy.

USE OF THE RÖNTGEN RAY IN KIDNEY SURGERY

With regard to the first of these methods, namely, the use of the X-ray, in surgery of the kidney, its especial advantage, aside from its ability to throw shadows in the presence of tumors and other pathological conditions of the kidney, lies in its power of discovering stones of the kidney. While, formerly, and in part even to-day, photographing renal and ureteral calculi by means of the Röntgen ray was and is considered an uncertain method of examination, which in positive cases proves the existence of a stone, but in negative cases does not exclude its presence, we are at present standing on more certain ground in this method of examination. With a further improvement and development of X-ray technique we have succeeded in showing calculi by its application in every instance.

Our experience has proved that every stone in the kidney becomes visible on a good X-ray plate, if the proper technical precautions are observed, and that, on the other hand, if the plate fails to show a shadow, a stone is not present. Among 84 operations for renal calculi, 65 gave perfect X-ray pictures of stones after our technique had been perfected, and by operation a stone corresponding exactly to the picture, was laid bare. On the other hand, we have an equally large number of cases in which, clinically, there was a possibility of calculus, but which failed to give a positive X-ray result. In these cases operation disclosed hydronephroses

[1] This contribution will be followed by articles upon the same subject by Professor Kapsammer of Vienna, and others — ED.

and pyonephroses, etc., and in one case a tumor. Among 362 patients, a total of 328 X-ray examinations were made on account of nephrolithiasis.

TECHNIQUE OF X-RAY EXAMINATIONS FOR RENAL CALCULI

Formerly a slender body and the presence of a large and dense calculus were considered the chief requisites necessary that a stone might become visible, and that the presence of a thick panniculus adiposus or of soft small stones made it impossible to obtain good skiagrams. To-day, regardless of the state of nutrition of the patient or of the chemical composition of the stone, we succeed in demonstrating the presence of the stones by means of the X-ray plate. Without going into the details of the technique, which we have more fully discussed in a former paper, and which O. Rümpel has described *in extenso* in the Röntgenatlas, "The Diagnosis of Renal Calculus," it is only necessary to remark that a carefully selected position of the patient, a good, soft tube, and a well-adapted diaphragm are the principal factors in obtaining successful skiagrams. For a positive diagnosis, it will, of course, always be necessary that several skiagrams be made; in all the plates the calculus must be shown to be constant in contour and position. It appears to us that this constancy is very important in the differential diagnosis, and that it is a characteristic sign of stone. In regard to the position of the stone on the X-ray plate, the shadow is usually found several centimeters from the spinal column, a little below the twelfth rib, corresponding to the anatomical position of the pelvis of the kidney. This is about the point where a horizontal line drawn through the body of the second lumbar vertebra meets the twelfth rib. Sometimes the shadow is found a little higher on the twelfth rib itself. The secondary stones of pyonephroses show greater variations in their positions, since these stones sink down in the dilated and altered pelvis, and like coral rays grow into the enlarged calices and pelvis. The resulting dentate masses, from which a spur-like process extends into the renal pelvis pointing downward and inward, are characteristic, and by these peculiarities differentiate themselves from intestinal contents and other accidental confusing elements. Where a high degree of pyonephrosis exists, the shadow cast by the stone may become visible much lower down in the neighborhood of the ilium. In a case of horseshoe kidney, the left half of which showed hydronephrotic degeneration and contained stones in its cavity, the shadows of the stones were close to the tenth dorsal vertebra. Such a displacement of the shadow should therefore suggest a horseshoe kidney. One shadow, which was of the size of a dollar, was shown, after removal of the pyonephrotic kidney, to be a dilated calix filled with firmly stratified sand. Notwithstanding the firmly packed arrangement, the finest grains gave distinct shadows.

A systematic examination of the X-ray plate is of great importance. For its correct interpretation, not only a certain amount of experience in observation, but also a proper light, is necessary. We are accustomed to examine our plates in a dark room, placing them in a cabinet which can be lighted up with lesser or greater intensity. We even sometimes use opera-glasses for the examination, in order that the contours may be seen from the proper distance and that the delicate shadows may be interpreted with greater certainty.

CATHETERIZATION OF THE KIDNEYS IN RENAL SURGERY

With reference to the application of the cystoscope in renal surgery, it may be stated that this instrument has, for a long time, been generally used by the surgeon, since its value, when skillfully handled, is apparent. Ureteral catheterization, on the contrary, has still to fight against many objections, due, it appears to me, more to theoretical prejudices than to practical experience. I believe that no one, who has mastered the technique of ureteral catheterization, will oppose it, nor has ever seen bad results from its application. In the rare and exceptional cases in which I was compelled to undertake an operation on the kidney without previous catheterization of the ureters — this having been impossible — I could not overcome a sense of uncertainty, and the feeling that the diagnosis was incomplete. In these cases in which the condition of the opposite kidney was unknown, I have preferred to con-

tent myself with a nephrotomy, and after having thus cleared up the conditions, followed the nephrotomy by nephrectomy, notwithstanding the fact that this course increased the danger to the patient and the possible disturbances in the wound-healing. I refer here in particular to kidney disease in children, in whom the small and narrow lumen of the urethra will not permit of the introduction of a urethral cystoscope. I have succeeded in performing ureteral catheterization in girls of twelve years and boys of fourteen years of age.

In many cases the cystoscope will assuredly be able to give valuable information in regard to the existence of renal disease. In the first place, the cystoscope shows whether or not two ureteral openings are present, whether they are functionally active, and whether clear, turbid, or bloody urine issues from them. Frequently a change in the ureteral openings will allow one to draw conclusions as to the presence of renal disease; they may be gaping and their lining membrane prolapsed; the surrounding mucous membrane may show inflammatory changes; there may be ulcerations surrounding the suspected openings — a condition which we have had opportunity to note, almost without exception, in cases of renal tuberculosis. But all these symptoms are more or less subjective, and are subject to all varieties of deceptions. The objective judgment demands an accurate examination of the issuing urine before it has become mixed in the bladder with the secretion of the other kidney, and has been passed per urethram. The safest method of obtaining this "kidney urine," and the one open to least objection, is that of catheterization of the ureters.

URINE SEGREGATORS

We have repeatedly tested the recently constructed instruments which are said to collect the urine separately from each kidney without catheterization of the ureters. In those cases in which catheterization of the ureters is impossible on account of displacement of their opening, or in cases which show a high degree of contraction of the bladder, or in which, for any other cause, ureteral catheterization is impossible even to the most expert — in these exceptional cases such instruments should be of greatest value, and I would recommend their invariable utilization. However, it does not seem possible, according to our experience, that they are able to displace ureteral catheterization, or to give the same perfect results. Neither the segregator described by Neumann, nor the instrument constructed by Down, which attempts to form a dividing wall between the ureteral openings by pushing upward the floor of the bladder through the vagina or rectum, is able to separate the urines with absolute certainty. The segregators designed by Luys and Cathelin, also, although ingeniously contrived and mechanically perfected, did not always give us satisfactory results, even though the latter frequently agreed with those obtained by ureteral catheterization. The same is also true of the various similarly constructed segregators.

TECHNIQUE OF URETERAL CATHETERIZATION

We note with great pleasure that ureteral catheterization, formerly so much maligned, is at present becoming more commonly used, being practically applied. Of course, ureteral catheterization presupposes a certain amount of technical experience and skill on the part of the examiner. A cystoscope in the hands of the unskilled and awkward is an instrument of torture for the patient, while the delicate and facile use of even the ureteral catheter causes no severe pain to the person undergoing examination. Except with children, we have hardly ever found it necessary to employ narcosis, but were able to reduce the pain to the minimum by injecting a one-half-per-cent solution of eucaine, or, in the case of sensitive patients, by a preliminary injection of a morphine-scopolamine solution (0.01–0.0005). In a few instances, lumbar anæsthesia, by means of stovain, novocain, or alypsin, was successfully employed.

The instrument used by us is our modification of Schlagenweit's ureter-cystoscope, manufactured by Reiniger, Gebhard, and Schall, and, on account of its exchangeable optical part, it may be used simultaneously as an irrigating-catheter and to collect the urine of the non-catheterized kidney.

Of prime importance in performing ureteral catheterization, as in all surgical interventions, is the most painstaking asepsis and antisepsis. Sterilization of the cystoscope and sounds,

thorough washing out of the bladder, and the use of absolutely sterile glycerine, and other necessary paraphernalia, are, of course, understood. The theoretical possibility of infection is reduced to a minimum by careful antiseptic precautions, and practical experience in the examination of many hundreds of cases has proved to us the safety of the methods which we practice. This has reference exclusively to patients who were under medical observation for a long time after ureteral catheterization.

METHODS OF DETERMINING THE RENAL FUNCTION

We turn now to the newest, but nevertheless important, method of examination; namely, the determination of the function of the kidney. We have tried a great variety of methods, the injection of methylene blue and of indigocarmine, the phloridzin method, the determination of density of solution by electric conductivity, and, finally, cryoscopy. This last method, by which the freezing-point of the urine, and, above all, of the blood, is determined, seemed to us, if correctly carried out, to give the most certain and most accurate results. We have come to use it almost exclusively. Frequently we have used several methods to ascertain the functional power of the kidneys, but have not neglected the determination of the amount of urea or cryoscopy in any case. It need hardly be stated that before we resort to the use of the ureteral catheter and cryoscopy, the old and tried methods of palpation of the kidney, and the careful physical, chemical, and bacteriological examination should be carried out.

DETERMINATION OF THE AMOUNT OF UREA

Even though the determination of the amount of urea gives no absolutely trustworthy results, nevertheless I consider it of some value when the separate urea excretion of one kidney is compared with that of the other. If we assume that normally functionating kidneys must excrete a certain amount of urea, it is evident that we may also assume a functional incapacity of the kidney, if it is unable to excrete this product of metabolism in sufficient amount. Unfortunately, the amount of urea excreted under normal conditions is subject to considerable variation, amounts varying between twenty and twenty-five grams per diem being ordinarily considered the average. It is therefore concluded that if the urea excreted during twenty-four hours is less than between fifteen or sixteen grams and one half, the average amount, it may be assumed that an insufficiency of the kidney exists, of such extent that the removal of a kidney would not be advisable. In a large number of cases we have made the urea determination in every instance before operating on the kidney. The results, in general, agree with those of the more accurate methods of cryoscopy. In cases in which we undertook the extirpation of one kidney, the daily excretion of urea exceeded sixteen grams. It goes without saying that the daily excretion of urea cannot be considered the exclusive indicator of the sufficiency of the kidney, nor will a single determination of the amount of urea secreted in a day be of much value. However, the figures obtained in a series of consecutive days, the patient taking the proper amount of nourishment, if they are approximately identical, are valuable. A comparatively certain conclusion in regard to the function of the kidney can only be drawn after the comparison of the amounts of urea contained in the urine of each separate kidney.

To determine the amount of urea, we use the apparatus of Esbach and Paris, which is simple and accurate. By shaking the mixture of urine and alkaline bromide in a graduated glass tube, the urea is decomposed, and the nitrogen thereby liberated is measured by the volume of displaced fluid. Reference to special tables gives the percentage of urea. Testing the apparatus with previously weighed quantities of urea gives good results.

THE PHLORIDZIN METHOD

We believe the phloridzin method must be looked upon as a useful chemical method of determining the functional activity of the kidney. It appears to us to have decided advantages over the use of methylene blue and indigocarmine. The ability of phloridzin to produce a renal glycosuria, first discovered by von Mehring, and further experimentally tested by Klemperer, Achard, and Delamare, was utilized by Caspar to determine the sufficiency of the kidney. After a subcutaneous injection

of 1 to 1.5 mg. of phloridzin, the healthy kidney excretes urine containing sugar after 15 to 20 minutes, whereas a sugar reaction is shown much later, or not at all, by the diseased kidney. If a ureteral catheter is placed in each ureter, the sugar reaction may be observed and controlled for a longer time. Casper employed this method in a large series of cases and found it to be reliable. We have also tested it in a number of cases, and were able to prove its accuracy by subsequent operations.

Our experience with the phloridzin method has not been sufficiently extensive that we could give a final opinion as to its value. There are cases and circumstances in which it has shown itself not absolutely reliable, and Casper himself has called attention to some necessary restrictions. In any case, I should consider the method a valuable addition to the means of kidney diagnosis, especially since it may be combined with the ureteral catheterization performed before every operation.

THE INDIGO-CARMINE METHOD

The use of indigo-carmine, which was introduced as a method of kidney diagnosis by Voelkers and Joseph, has undoubted advantages over the use of the methylene blue of Castaigne, since the blue color of the former is much less changed by the urine. This method is very welcome, as it is a decided aid in catheterization of the ureters. For the beginner it locates more accurately the ureteral openings, which are not always easy to find, by the blue stream of urine, and it also aids the more skillful examiner in the search for these openings when they are indistinct in cases of severe ulcerative cystitis, in trabeculated bladders, and also in cases of bladder tuberculosis. We are also able to show by the indigo-carmine method whether or not two ureteral openings, and consequently two kidneys, are present, and whether the latter excrete urine. Also, the accidental escape of urine alongside of the introduced ureteral catheter becomes distinctly apparent to the examiner. Catheterization of the ureters and the diagnosis of the functional activity of the kidneys will, however, not be rendered superfluous by the indigo-carmine method. Even though we know that both kidneys secrete urine, the one perhaps more than the other, we cannot from this alone formulate any judgment as to the comparative activity of the two organs, nor as to the density, urea concentration, or molecular qualities, or, in short, of the conditions of the separate urines from each kidney, and this is necessary before any radical operation be undertaken. We must know with certainty whether the kidney which is to be left is healthy or able to take upon itself the function of the one to be removed. These questions are answered accurately by ureteral catheterization and functional kidney diagnosis. The observation of the urine escaping from the ureteral openings, and the judgment of the functional activity based thereon, does not appear to be safe. In no case does the indigo-carmine method make ureteral catheterization unnecessary.

CRYOSCOPY

Concerning cryoscopy, it may be stated that this is not an entirely new science; however, its application in medical research was noticeably neglected. This may be due, in part, to the widely circulated opinion that it is a technically difficult and troublesome method, but, above all, it appears to us that there is a lack of publications which offer a critical judgment based on experience with a series of carefully examined and carefully controlled cases.

During the last five years we have undertaken a methodical determination of the freezing-point of the blood and of the urine, and our researches include more than one thousand cases. We therefore believe that from a practical standpoint a certain significance must be conceded to our observations.

The idea on which the method is based is that the function of the kidney must be considered as osmosis, or in other words, that the work of the kidney may be calculated from the product of the gland, i. e., from the urine and its source, the blood, or rather the blood-serum, and that these two fluids, the solvent of which is water, are subject to the laws of osmosis. By osmosis we understand the changing relations between two chemically similar solutions of different concentrations, which have for their purpose the equalization of these differences of concentration. The equalization of the difference of osmotic pressure between the blood, i. e., the serum, and the urine takes

place in the kidney. By virtue of its two antagonistic functions — the secretory activity of the glomeruli and the resorptive power of the convoluted tubules—the kidney, aiming in two directions, undertakes the regulation of the differences in tension, which are constantly being influenced by the metabolism, the heart's action, etc.

This ingenious theory, which is built on von t'Hoff's teachings of osmotic pressure, was expounded by A. von Koranyi, to whom the honor of having created a new method of examination in applied medicine is due. Koranyi found, as had already been shown by others in the physiological laboratory, that in man there is a marked constancy of the osmotic concentration of the blood while the kidney function remains normal, and that, on the other hand, there is an increased concentration of the blood if there is kidney disease. He found, further, that with the increase of the osmotic concentration of the blood there was a corresponding decrease in the osmotic pressure of the urine. Everything was interpreted from the premises that while the kidney function is normal, all nitrogen-containing molecules will be excreted by the kidney, while if there be a disturbed kidney function a retention of nitrogenous compounds in the blood will occur.

From these extraordinarily interesting facts, which appeared in several publications of von Koranyi's toward the end of the nineties, and which were confirmed by other investigators (Richter and Roth, Sanator, Casper, Lindemann, and others), we also hoped to be able to derive practical advantages for the surgery of the kidney, especially by the combination of this method of examination with the use of the ureteral catheter.

In regard to the method of examination itself, the osmotic concentration is determined by the lowering of the freezing-point. The more concentrated a solution is, the farther is its freezing-point below that of distilled water.

If we say "concentrated" for the sake of brevity, we always mean the molecular concentration in an osmotic sense, which must be differentiated from molecular concentration in a purely physical sense. While the latter states how many grams of molecules are present in a liter of fluid, the osmotic concentration designates, in addition, the number of molecules plus ions, the latter being considered the carriers of the power of electric conductivity. As is well known, the most recent method of investigating the osmotic concentration rests on this conception. By this method the density of the solution is determined by its conductivity of the electric current.

THE DETERMINATION OF THE ELECTRIC CONDUCTIVITY

We possess a valuable method of examination in the determination of the electrical conductivity, which, in case we have only small amounts of urine — 1 to 2 c.c. — at our disposal, gives us information in regard to the function of both kidneys.

This is made possible by the parallelism which exists between the results obtained by this method and those obtained by cryoscopy. We thus obtain comparative values of the amount of inorganic constituents of the urine, especially of the salts, which latter also play the chief role in cryoscopy. In forty normal urines, we found as values for the conductivity, expressed in reciprocal ohms, of 0.0129–0.0243 = 1.25°–2.39°. In pathological cases the values may sink to 0.0075 ($\Delta = 0.55°$), or even lower. (These figures agree with those found by others.)

As to the performance of the examination, it is comparatively simple; it requires less time than a cryoscopic examination; several examinations may be carried out in a very short time.

The examinations which we made were carried out with an apparatus furnished by Reiniger, Gebbert, and Schall. It is practical, and works well.

This method of examination is not so well adapted for examination of the blood as is cryoscopy. Our former assistant, Dr. Engelmann, has given a detailed report of the technique and of the results of this method.

TECHNIQUE OF CRYOSCOPY

Now, in regard to cryoscopy, I wish again to go into the technique of this procedure, since I cannot free myself from the impression that the results reported by others, which disagree entirely with our extensive observations, are

due to a deviation from the necessary rules of procedure. We have often noticed that the results of the examination of the same patient by several persons showed wide variations. In one instance another operator performed nephrectomy on account of disease of one kidney, in spite of a freezing-point of 0.6°. A functional disturbance on the part of the remaining kidney did not supervene, and therefore this case might be cited against the disturbance of function in the presence of a low freezing-point, were it not for the fact that an examination of the same blood by one of our examiners, who had experience with our method, showed a freezing-point of 0.57°. We consider it of great importance, in order that incorrect results may be avoided, that as large a series of examinations as possible shall be made by the same individual, and his figures proved by one or several other skillful examiners. In our laboratory it is customary that the physicians making the cryoscopic examinations shall make from forty to fifty tests, and that these be proved by skillful colleagues before they can claim a perfect technique. If this practice had been followed by other surgeons interested in cryoscopy, and if a larger series of correctly performed examinations, that had been made after thorough practice with the method, and the results proved, had been published, I have no doubt that the same favorable results noted by us would have been obtained. Occasional scattered reports and smaller series of observations, for the correctness of which only a single uncontrolled observer is responsible, are uncertain, and are slight evidence against a method which, in over one thousand cases, has never failed us, and has always proved itself reliable.

The determination of the freezing-point is carried out with Beckmann's apparatus. This consists principally of a very fine thermometer with one hundred divisions, each of which is again divided into one hundred parts. The thermometer is immersed in a glass cylinder, in which the fluid to be examined is kept in constant motion by means of a platinum rod. The glass cylinder, with the thermometer and fluid, is placed in a freezing-mixture at a temperature of minus four degrees Celsius. While being constantly stirred the fluid is undercooled. A moment then supervenes when the fluid congeals. By the change from a liquid to a solid state, heat is liberated, which permits the column of mercury to snap up to a certain point, where it remains stationary for a time; this is the physical freezing-point. After standing for a time, the column of mercury again falls, and gradually reaches the temperature of the surrounding freezing-mixture. If, now, one determines in a similar manner the freezing-point of distilled water — the scale of Beckmann's thermometer is not numbered, and the zero-point is not fixed — and subtracts the figure obtained from the freezing of the solution (i. e., the blood) from that obtained by the freezing of the water, the remainder is the figure which shows how much lower the solution freezes than distilled water. In the case of blood this difference is 0.56° C. One says, in short, the freezing-point of blood is 0.56°, and a special sign has been chosen for this, viz., δ, while Δ designates the freezing-point of urine.

Our method of examination of the blood is as follows: Under aseptic precautions a hollow needle is thrust into an artificially congested vein of the arm, and from 15 to 20 c.c. of blood removed. This is caught up in the glass cylinder used for the examination, and is defibrinated by stirring with the platinum rod, immediately after which the freezing-point is determined. In a second cylinder the freezing-point of distilled water is determined each time. This latter procedure we consider necessary, since the position of the mercury in the U-shaped Beckmann thermometer is subject to variations, and because the newer thermometer with a fixed zero-point does not appear to us to be reliable. With sufficient practice the time necessary for the examination is from fifteen to twenty minutes.

We would like to point out some of the sources of error, which easily disturb the inexperienced examiner, and which have often led to incorrect results. Aside from keeping the apparatus in the most perfect condition, there are two points which must be carefully observed: 1. The bulb of the thermometer must be completely immersed in the fluid to be examined, without, however, touching the bottom of the glass cylinder; in other words, the mercury must be completely surrounded by the solidifying medium, so that neither the warm air

stratum above nor the cold glass surface below influences the effect of the heat given off at the moment of freezing. 2. The fluid must be kept in constant motion by means of the platinum rod, and while the former is solidifying, and when the column of mercury has shot up, the motion must be continued until the mercury again begins to fall; the highest point reached by the mercury is the freezing-point. Only repeated provings by himself, and also provings by others, give the examiner the necessary skill and accuracy in making the test. The fluid to be examined may be thawed several times and refrozen, to prove the correctness of the result.

PRACTICAL EXPERIENCE WITH CRYOSCOPY

By the method just described we have examined over twelve hundred cases up to the present time.

GROUP I. CASES WITH A NORMAL FREEZING-POINT

If we divide our examinations into three groups, the first group — about one third of the examinations — will comprise those patients in whom there was, to a certain extent, a suspicion of the existence of a disturbance of the kidney function, but which did not show any evidences of kidney disease during their sojourn in the hospital. These examinations, which were undertaken without any special regard to age, sex, condition of nutrition, body temperature, etc., in a large majority of the cases gave a constant concentration of the blood, corresponding to a freezing-point of 0.56°, or showed only slight variation of 0.57°. In anæmic patients we several times found 0.55° or less. These results correspond, in the aggregate, with those of other investigators, which also proves that with an undisturbed renal function the molecular concentration of the blood is very constant, and in the mean may be expressed by a lowering of the freezing-point of 0.56° C. In addition, we have shown by examination that in acute diseases, also, no change occurs in the molecular concentration of the blood if the kidneys remain intact. For example, it has been claimed that increased concentration of the blood supervenes in typhoid fever, supposedly due to antitoxine formation. Our former assistant physician, Dr. Rumpel, succeeded in showing that these claims resulted from incorrect methods of procedure, since in a series of typhoid cases he was able to show a normal blood concentration in all stages of the disease, which findings were later confirmed by von Koranyi.

GROUP II. CASES OF DISTURBANCE OF THE TOTAL KIDNEY FUNCTION

Group II comprises the examinations made in cases of existing kidney disease, which induced a disturbance of the entire renal function. Of these cases, the most important were cases of chronic nephritis, of which a part came for examination in a condition of uræmia. Further, there were cases of cystitis with ascending pyelonephritis, resulting especially from prostatic hypertrophy, and further, cases of bilateral tuberculosis and of tumors. In a part of these cases the proof of bilateral disease was furnished by autopsy; in the remainder, by operation. The concentration of the blood was found higher than normal in all these cases, which condition was indicated by the lowering of the freezing-point below 0.58°. The majority of the figures varied between 0.60° and 0.65°. In a number of cases we were able to observe the beginning of a uræmic attack in a most striking manner, by the lowering of δ. Coincident with the increase in the concentration of the blood, we were able, in almost all cases, to show a decrease in the molecular concentration of the urine. The majority of the figures varied between 0.9° to 0.3° and 0.2°; occasionally Δ — 1.0 and more were temporarily observed. This again proves that the concentration of the urine alone is not explicit; rather, it has only a relative value.

LOWERING OF THE FREEZING-POINT IN OTHER DISEASES WITH NORMAL KIDNEYS

Of greatest importance is the question of the lowering of the freezing-point in other diseases, in which the kidneys are intact. Just this eventuality has frequently been accentuated as a factor which decreases the accuracy of the method. Even Koranyi, in his first epoch-making publication, noted certain restrictions. For instance, he found a not inconsiderable lowering of the freezing-point in cases of incompensated heart disease, and in severe pneu-

monias accompanied by cyanosis. We always use cyanotic blood, since we take it from a congested vein of the arm, and nevertheless obtain normal values. This is very simply explained by the fact that venous blood, agitated in the presence of air, changes to arterial blood. Since Koranyi's results seemed to require correction, we have instituted exhaustive experiments, the details of which are given *in extenso* in another place.[1] We found in nine cases of uncompensated heart disease, several of which were severe cases, with a high degree of cyanosis, ascitis, and hydrothorax, that the blood concentration was always normal. This proves that, according to our technique, cyanosis has no influence on the concentration of the blood. In a series of pneumonias, Neudörfer did not succeed in showing an increase in the concentration; but, on the contrary, a decrease of the molecular concentration to 0.52° was noted.

FREEZING-POINT IN FEVER

Further examination of fever patients in general showed not a single instance of lowering of the molecular concentration in fifty cases. The same is true of slight elevations of temperature to 38° C. of about twenty-four hours' duration. In fever, if the kidneys are normal, the freezing-point of the blood is elevated 0.02° to 0.03°, which never indicates disturbed kidney function. Likewise in anæmic individuals, δ is often somewhat elevated, the kidney function being normal. We have performed nephrectomies on anæmic patients suffering from tuberculosis of the kidneys, in whom the blood examinations showed a freezing-point of 0.54° to 0.53°, once even $\delta = 0.52°$, without the slightest disturbance of the kidney function; neither had any disturbance been expected.

FREEZING-POINT IN ECLAMPSIA

In several cases of eclampsia which we examined, we found an increased blood concentration, up to 0.60°; a result which corresponds entirely with the clinical alteration of the kidneys, as evidenced by the large albumin content of the urine, and the diminished renal excretion.

The lowering of the freezing-point in diabetic coma, which we were able to demonstrate a number of times, seems to have the same explanation.

FREEZING-POINT IN TYPHOID FEVER

Contrary to the lowering of the freezing-point found by Waldvogel, Rumpel, as already noted, found a blood concentration of 0.56° to 0.57° in a series of ten cases of typhoid fever with healthy kidneys, both during the stage of fever and during convalescence.

FREEZING-POINT IN CASES OF ABDOMINAL TUMORS

It appears to me that for the surgeon the question is important whether or not large abdominal tumors, either connected with the kidney or other organs, are able to cause a lowering of the freezing-point. Koranyi assumed that perhaps such large tumors might be able to increase the density of the blood, by causing an intensified albumin disintegration, or by producing a mechanical congestion. We cannot entirely agree with the opinion of Koranyi. Among our first examinations was a case of very large ovarian cyst, in which a possibility of compression of the ureter existed. In this case a lowering of the freezing-point was noted, but in many other cases of large abdominal tumors the freezing-point of the blood was constantly found to be normal, provided the kidneys were intact. Neudörfer has come to the same conclusions, after an examination of ten large tumors of the abdominal cavity.

FREEZING-POINT IN CASES OF MALIGNANT TUMORS

As far as malignant tumors are concerned, either of the abdominal cavity or of other organs, it may be stated that we have always found a normal freezing-point, as long as the patients were in a relatively good condition, in cases of carcinoma of the uterus, the cæcum or other parts of the intestine, of the stomach, and of the mammary gland. In all cachectic patients, regardless of the location of the disease, in whom, consequently, the metabolism was below par, and who, in part, showed diseased kidneys, the freezing-point was found lower than normal.

[1] A. Neudörfer. Zur Frage der Kryoskopie u. ihrer Technik. Grenzengebiete, bd. xvi, h. 1.

FREEZING-POINT IN CASES OF LARGE KIDNEY TUMORS

As to the most important variety of tumors, namely, those of the kidney, we have never found the freezing-point depressed below 0.60° or more in cases of unilateral disease of this organ, either in cases of malignant tumors, or in cases of large pyonephrotic sacs, even when they reached the size of an adult head, and our observations comprise a large number of pyonephroses and hydronephroses, some of very large size, and also a large number of malignant tumors. Isolated observations of depression of the freezing-point in such cases, as related by Israel and others, are at variance with our large series of cases.

CAUSES OF THE DIFFERENCES IN THE RESULTS OF CRYOSCOPIC EXAMINATIONS

The variations in the results depend on the differences in technique. It would seem to be of utmost importance to ascertain and equalize the differences in this regard. I have just referred to an article by Dr. Arthur Neudörfer of our division, which treats exhaustively of our technique. Unfortunately, up to the present time the majority of investigators have published the results of their experience with cryoscopy in only a few instances, and without going into the details of their methods. Also, the number of their examinations is so small, that it would hardly seem sufficient that a perfect technique might be presupposed. Rovsing and Koch alone have undertaken exhaustive cryoscopic examinations in forty instances, among a large series of cases, and have obtained results at variance with those obtained by us. Koch, in his carefully prepared paper, describes in detail the technique followed out by himself and Rovsing. This differs from our technique in essential points, and consequently their figures are entirely different. Their method of cryoscopy requires about two hours' time, and for this reason alone would not be adapted for practical application Their numerical values are such that errors, both in positive and negative directions, are unavoidable, and I agree entirely with Rovsing, when he insistently warns against deciding for or against operation according to the results of such cryoscopic examinations. Naturally, he can form a judgment of the value of cryoscopy only from the results of his methods. Had he used the method which we have proved in many hundred cases, and worked out during the last six years, I have no doubt but that he would have obtained as positive results as we did. The use of Koch's method demands an entirely different interpretation of the figures. I shall take up this paper in another article.

We have already referred to the fact that we have had the experience that different examiners, using blood from the same patient, have obtained results that were entirely different from each other and showed enormous variations. For example, I have referred to the removal of a tubercular kidney by another surgeon, notwithstanding a lowering of the freezing-point of 0.6°. The function of the other kidney, nevertheless, showing itself to be normal, an examination of the same blood one half hour after operation, made by a more experienced examiner, showed a perfectly normal freezing-point of 0.57°. Such a case might easily have led to a mistaken conclusion. Also in the case, repeatedly referred to in the literature, reported by Wieberg and examined by us, in which a large kidney tumor was extirpated without fatal results, notwithstanding a freezing-point of 0.6°, we were not dealing with an intact second kidney. For, on the one hand, the patient excreted only 200 grams of urine, containing 10 pro mille albumin, the day after operation, and on the other hand, the patient dying some time after, autopsy showed a carcinomatous nodule in the remaining kidney.

THE FREEZING-POINT AS A GUIDE IN NEPHRECTOMY

It is, of course, a plausible possibility that, after additional experience, the limits of what can be considered the normal freezing-point will be widened. The numerical value of 0.6° may be entirely subjective. At any rate, according to our experience it marks the limit beyond which, to say the least, it seems extremely hazardous and inadvisable to remove a kidney.

DEATHS FOLLOWING NEPHRECTOMY IN PRESENCE OF A FREEZING-POINT BELOW 0.60°

For example, in the case of a patient whom I treated and observed for a number of months

on account of a bilateral pyonephrosis, and who had attained a relatively good condition after I had done nephrectomy, I could not, under any circumstances, make any attempt at a more radical operation, on account of a freezing-point of 0.64°. In my absence, notwithstanding my cautions, nephrectomy was performed, followed by death on the ensuing day.

In another case of bilateral suppuration of the kidneys, demonstrated by ureteral catheterization, and having an ascertained freezing-point of $\delta = 0.63°$, I laid bare and opened the large pyonephrotic sac on the right side, on account of the patient's high fever. I found a narrow margin of kidney tissue, hardly wider than the little finger, and consequently inferred that without doubt the kidney was incapable of functionating. In this mistaken opinion I decided on extirpation of the kidney, whereupon death followed after twelve hours.

Again, for a third time, in spite of a diagnosed bilateral lesion and $\delta = 0.60°$, we risked the removal of a completely disorganized kidney, in a case of bilateral pyelonephritis. This patient, also, died on the following day. We knew from the ureteral catheterization that the left kidney was not healthy (leucocytes, albumin, casts, etc.), and we also knew that it was not functionally perfect, since $\delta = 0.60°$. The right kidney had been transformed into a large pus-sac, and showed only little normal kidney tissue. The patient had a high fever, and a recovery, in the light of previous experience, was not to be expected. However, it seemed nephrectomy might prolong life and bring about a more bearable condition. We reasoned that by removing the disorganized kidney the fever would be done away with, while the further course of healing would be simplified and made more favorable for the patient. If Rovsing and those who support his opinion are correct in believing that the removal of the more severely diseased kidney has reflexly a favorable influence on the less diseased organ, notwithstanding a low δ, then nephrectomy is indicated, and may be considered a life-saving operation. Nephrectomy was performed, the patient died, and we again had a proof of the correctness of our assumptions and experiences.

Two of my Hamburg colleagues related similar experiences to me. In one case of apparently unilateral sarcoma of the kidney, extirpation was undertaken in presence of a freezing-point of 0.6°. Death occurred on the next day. In the second instance a kidney completely disorganized by suppuration was removed, without a preliminary determination of the freezing-point. A cryoscopic examination made after the operation gave a result of $\delta = 0.65°$. Death occurred on the fifth day, after several days of anuria. Autopsy showed that the other kidney was also destroyed and incapable of carrying on its function.

These are facts, not theoretical considerations, and these five unfavorable experiences, which speak for themselves, do not give me the necessary courage to undertake an extirpation of the kidney when there is a lowering of the freezing-point below 0.60°. I have related these cases individually in order to refute the mistaken accusation of Rovsing and Israel, that I have not undertaken any nephrectomies in cases that showed a lowering of the freezing-point below 0.60°, and that I have from the beginning assumed as true this unproved fact.

All nephrectomies which were shown to have a normal freezing-point before operation have invariably shown an entirely adequate organ after the operation.

GRADUAL SINKING OF THE FREEZING-POINT IN CASES OF ANURIA.

Regarding the case referred to by Israel, which showed a freezing-point of 0.56° during an attack of anuria lasting four days, I will say that this finding is completely at variance with our experiences, unless it be that the cryoscopy was undertaken during an early period of the attack. We have observed, also, that in anuria the freezing-point was normal at the beginning of the attack, but that after the retained products of metabolism began to accumulate, δ began, with absolute certainty, to rise more and more, reaching 0.6° and beyond, until death supervened. A short time ago I reported two such cases, giving particulars. In one case we had to deal with the removal of a shattered kidney, with congenital absence of the other organ; in the second there was anuria, resulting from corrosive-sublimate poisoning. In both cases, on the first day δ

was 0.57°, then 0.58° and 0.59°; on the fourth day, the day on which death occurred, it was 0.60° and more. A single determination of the freezing-point is not sufficient, but in such cases, as is our constant custom, cryoscopic examinations must be made on several successive days, if correct results are to be obtained. In cases of bilateral nephrolithiasis complicated by anuria, as well as in severe bilateral disease of the kidneys due to pyonephrosis, tuberculosis, tumors, or other causes, a freezing-point below 0.6° was constantly found. The conclusion may therefore be permitted, that the isolated observations referred to above cannot be considered of sufficient importance to discredit the value of cryoscopy, contradicting as they do our large series of cases, in which such conditions were not found once, and must be regarded as the results of errors in technique.

Group III. Unilateral Disease of the Kidney with a Normal Freezing-point of the Blood

The third group of our freezing-point determination comprises those cases which clinically were shown to have a unilateral disease of the kidney and which showed no disturbance of the total kidney function. This series is made up of cases of pyelitis, nephrolithiasis, pyonephrosis, tuberculosis, hydronephrosis, and tumors. In all these cases we found a normal concentration of the blood, the freezing-point being between 0.55° and 0.57°, and therefore within the limits of what we consider normal. In a few cases of anæmia, as already mentioned, the freezing-point was somewhat elevated to 0.53° and 0.52°, a condition of no importance for the determination of the kidney function. On the other hand, there existed a normal concentration of the urine, with an adequate excretion of urea, notwithstanding the fact that the entire urine was contaminated with pus, blood, epithelial cells, bacteria, etc., and showed the clearest signs of kidney disease. That in all these cases we had to deal with a unilateral disease was shown not alone by the clinical findings, but also by the numerous recoveries following nephrectomy. In five cases, autopsy showed that a normal kidney had been left.

Catheterization of the Ureters, and Determination of the Freezing-point of the Urine of Both Kidneys

On this occasion I wish to direct attention to the great diagnostic value of the combination of cryoscopy and ureteral catheterization. In the large majority of cases the separated urines obtained by ureteral catheterization were subjected to examination and the results compared.

Cryoscopy of the mixed urines has no significance, and is of no value.

While under normal conditions of renal functions the molecular concentration of the secretions of the two kidneys is approximately the same — and we have a large series of cases proving this assertion — as soon as one kidney pelvis or one kidney itself becomes diseased, a greater or lesser disturbance of the function of this kidney at once develops. This unilateral functional disturbance is shown by the altered molecular concentration of the urine, coincident with a diminished excretion of urea, the other kidney at the same time showing no change of its function. By means of the ureteral catheter we have learned that even a comparatively slight localized disease of one kidney, be it a focal disease, a disease of the kidney pelvis, calculus, tubercular focus, etc., causes a unilateral disturbance of the affected organ, and is evidenced by the molecular concentration of the urine. These facts are of the greatest importance; they show the high diagnostic value of the functional examination, to which for a long time the value which it possesses has not been acceded. When functional disturbance can be demonstrated, then, at least according to our experience, a disease of the kidney exists.

Reflex Anuria

Reflex disturbance, according to our experience, is of rare occurrence. In the numerous cases that came under our observation, a distinct reflex disturbance of function was not found once. We should rather believe that in the majority of the cases formerly considered but not proved to be instances of reflex anuria, a disease of the other kidney already existed, which, however, could not be diagnosed. In the cases which we observed, a bilateral disease

always existed. Also, the relative frequency of bilateral calculi would sooner refer a suddenly developing anuria to this condition than to a reflex origin.

VALUE OF CRYOSCOPY IN DIFFERENTIAL DIAGNOSIS

In all cases difficult of diagnosis from a differential standpoint, the determination of the molecular concentration of the blood and urine has proved valuable. In those cases of hæmaturia without a clear ætiology, for example, cryoscopy often at once clears the diagnosis, or at least aids in locating the disease. In this particular, it has become an absolute necessity for us, and permits the making of an absolute diagnosis by the aid of the ureteral catheter. Of greatest importance is the differential diagnosis between stone in the kidney (or tumor of the kidney) and hemorrhagic nephritis with unilateral renal pain. We have had the opportunity to examine several cases in which, besides hæmaturia, pain was present in the region of one kidney, and the diagnosis of stone therefore suggested. However, an increase in the molecular concentration of the blood, up to 0.65° and a simultaneous and permanent decrease in the concentration of the urine showed that a bilateral disease must exist, and the further clinical observation proved this assumption. In several of these cases, contracted kidneys were the cause of the trouble, as was shown later by the autopsies. In one very interesting operated case a bilateral cystic disease of the kidneys was present.

IMPORTANCE OF CRYOSCOPY FOR PROGNOSIS

In cases of cystitis due to prostatic enlargement, cryoscopy is of value from a diagnostic and prognostic point of view. In a number of cases of prostatic hypertrophy, with beginning retention and without demonstrable pyelitic changes, we have found a marked elevation of the concentration of the blood, even to 0.71°. Death soon ensued in these cases, and the autopsies showed advanced pyelonephritic processes, which had not been apparent clinically in the patients who appeared strong and hearty. On the other hand, a normal freezing-point indicates an absence of severe disease of the kidney in cases of prostatic hypertrophy. The application of cryoscopy in these cases has been of great service, not alone from the standpoint of prognosis in general, since uræmia, the well-recognized terminal stage of prostatic disease, sometimes occurs quite suddenly and without prodromata, but also in regard to the advisability of performing a radical operation. In the presence of a low freezing-point, below 0.6°, we have decided against operation, while a normal freezing-point, as far at the kidneys were concerned, seemed to indicate the operation. Sometimes the insertion of a catheter à demeure, and relieving the retention of urine, succeeded in removing the effect the retention had had on the kidney function, and obtaining a more favorable δ.

In making a more positive diagnosis of renal tumors, cryoscopy may also be of value. In two cases of encapsulated Grawitz's tumors which involved only the suprarenal bodies, without having any communication with the renal pelvis, and caused no macroscopical pathologial changes in the urine, we were able to show a decrease in the molecular concentration of the urine of the diseased kidney. At the same time, we found a large amount of albumin in the urine from the diseased kidney in both cases, while the urine from the opposite side contained none.

CRYOSCOPY IN NEPHRITIS

Finally, we desire to refer briefly to the functional examinations we have made in nephritis. Recently, there have been communications from various sources in regard to the unilateral nature of nephritis, which might possibly make this disease amenable to surgical intervention. Without wishing to discuss this subject at length, we wish to state the results of our examinations having bearing on this matter. Assuming that by determining the function of the kidney, conclusions might perhaps be drawn as to the existence of a unilateral or a bilateral disease, we obtained the separated urines from the two kidneys in a series of cases of nephritis in the acute form, as well as in the chronic interstitial and parenchymatous forms. In the cases thus far examined, the concentration of the two urines was almost identical, only the albumin content in some cases showed marked differences. Unilateral nephritis we were able to

demonstrate only twice, in the early stages of the disease.

SYSTEM OF EXAMINATION OF OUR KIDNEY CASES

The examination of our kidney cases in general, and especially before operation, was usually carried out as follows: After the history had been obtained in the usual way, and after palpation, etc., a thorough examination of the urine is undertaken, followed by cystoscopy, and especially by catheterization of the ureters. The urine obtained from each kidney is now examined as to its urea content, and its freezing-point is determined. In addition, the concentration is often measured by its electrical conductivity, and the results obtained from the two organs are compared. Further, the urine is examined bacteriologically, microscopically and chemically, in the usual way, and this is followed by cryoscopy of the blood, if it has not preceded the other part of the examination. In the cases in which a renal or ureteral calculus is suspected, a skiagram is made in the manner already described. The other methods mentioned above, especially the indigo-carmine method, we utilize, wherever necessary, in cases of extensive ulceration of the bladder, in tuberculosis, and in cases of trabeculated bladder, as an aid in locating the ureteral openings. If, for example, the urine obtained by ureteral catheterization shows essential differences — from the one kidney a clear secretion, containing a sufficient amount of urea, without pathological admixture: from the other side, however, a turbid, purulent, or bloody urine, with a low percentage of urea and an essentially different concentration — under such circumstances one may presuppose the existence of one healthy kidney. Cryoscopy of the blood will always show a normal δ in these cases, and confirm the function of one organ. An exception to this rule was not found among our cases.

NEPHRECTOMY WHEN THE SECOND KIDNEY IS NOT PERFECTLY HEALTHY

More difficult to decide as to the permissibility of nephrectomy are, for example, those cases of pyonephrosis and tuberculosis in which ureteral catheterization has shown an extensive destruction of one kidney, and in which the turbidity and pathological character of the secretion of the other organ show that the second kidney also is not intact. In these cases, aside from the determination of the amount of urea and of Δ, the freezing-point of the urine, the result of cryoscopy of the blood has been the basis on which the decision for or against operation has been made. If in such cases of destruction of one organ and of moderate disease of the other, a normal δ was found, we considered this sufficient evidence that one kidney, although not intact, was still able to undertake the work of the one to be removed, to excrete the products of metabolism in sufficient amount, and to prevent a kidney death. In a large number of cases treated according to this principle, we have not been disappointed. The patients recovered and lived for a longer or shorter time, or are still alive with one not entirely intact, but, nevertheless, functionating, kidney.

VALUE OF CRYOSCOPY WHEN URETERAL CATHETERIZATION IS IMPOSSIBLE

Cryoscopy of the blood has proved itself of inestimable value in that group of cases in which, notwithstanding great skill, ureteral catheterization was impossible. I refer particularly to those cases of kidney tuberculosis and suppuration which secondarily cause such an extreme contraction of the bladder, and such an extensive ulceration of its mucous membrane, that filling the bladder is impracticable, and any attempt at cystoscopy, let alone ureteral catheterization, is impossible, even though deep narcosis or spinal anæsthesia be employed. The same is true of cases of renal disease in children in whom the narrow urethra does not permit the introduction of a cystoscope. In girls aged twelve and boys aged about fourteen years, we found ureteroscopy possible. If the determination of the freezing-point of the blood in these cases gave a normal δ, we considered this a proof that sufficient normal kidney tissue was present to excrete the products of metabolism. It was then only necessary to determine which was the diseased kidney. As is well known, in tuberculosis the results of palpation of the kidney are often negative, and no enlargement or subjective pain and tenderness are present

from which the location of the disease, whether right or left, might be determined. In such cases we usually succeeded by palpation in making out a thickening of a ureter, and this gave a clue as to the probable side of the disease. The kidney on this side was thereupon exposed, and if extensively disorganized, removed. We have had no unsuccessful results when nephrectomy was done under such circumstances. We were forced to admit to ourselves that such an extensively diseased organ could take no important part in the work of excretion, and that the normal freezing-point was necessarily due to a capable and sufficiently functionating organ, even though it might not be intact. If, on the other hand, we found a freezing-point below 0.6°, or even more, we have declined to remove one kidney, since the other organ was evidently also diseased. The bilateral nephrotomy which we frequently undertook for the removal of the pus and the alleviation of the patient's sufferings has always confirmed our judgment. In the remaining cases the necropsy showed the correctness of our diagnosis of bilateral disease.

OPERATIONS ON THE KIDNEY, IN PRESENCE OF A FREEZING-POINT BELOW 0.6°

We wish here particularly to emphasize the fact that in no case did a freezing-point below 0.60° deter us from operating; that in all cases of bilateral pyonephrosis, tuberculosis, stone, etc., we have operated, when operation appeared in any way indicated; and that we have observed many recoveries, especially in cases of bilateral infected and non-infected calculi, while in other cases the sufferings of the patients have been mitigated. We have never refused a life-saving operation to our patients, as Rovsing mistakenly supposes and asserts without taking into consideration our reports and our Table III.[1]

We have always operated if operation appeared to us in any way indicated. Nephrotomy was always performed, and we were able by laying bare the kidney to assure ourselves of the correctness of our diagnosis. However, we have never undertaken nephrectomy and removed the extensively diseased kidney if the other was functionally incompetent, for then, according to our experience, the patient would have succumbed without fail, as some of them did, notwithstanding this. That, on the contrary, we have not been conservative in performing nephrectomies, but have removed the diseased organ even if the other was not perfectly healthy, provided it was capable of undertaking the work of both organs, has already been remarked. Aside from ureteral catheterization, this absolute certainty was obtained by means of cryoscopy.

[1] Kümmell und Rumpel. Chirurgische Erfahrung über Nierenkrankheiten unter Anwendung der neuen Untersuchungsmethoden. Von Brün's Beiträge zur Klinischen Chirurgie, bd. xxxvii, heft 3.

CRYOSCOPY ALONE CAN NEVER DECIDE FOR OR AGAINST OPERATIVE INTERVENTION

I have described our procedure in detail in order to meet the incorrect conception that we base the indication for or against operation on cryoscopy alone. This has never been the case. In every instance, we have, whenever possible, catheterized the ureters, and also utilized the other well-known methods of examination. A careful analysis of the separated urines was made, and to the results so obtained were added the accurate and invaluable results of cryoscopy of the blood performed in the manner described, and the results of this latter test utilized as a criterion, especially in those cases in which ureteral catheterization and the other methods were unsuccessful. This method has never failed us.

If I should now be permitted to summarize in a brief manner our experiences with cryoscopy of the blood, I would formulate them as follows:

CONCLUSIONS DRAWN FROM OUR EXPERIENCE WITH CRYOSCOPY OF THE BLOOD AND URINE, AND ALSO WITH CATHETERIZATION OF THE URETERS

1. If the kidneys are intact, the molecular concentration of the blood is constant, and, on the average, corresponds to a freezing-point of 0.56°. This statement is based on the results of about seven hundred examinations. In weakened and anæmic individuals, figures of 0.55°, or even of 0.53° and 0.52° were sometimes observed.

2. Unilateral disease causes no change in the freezing-point of the blood.

3. The normal freezing-point, $\delta = 0.56°$, proves only that so much functionating kidney tissue is present as is necessary to excrete completely the products of tissue metabolism. Theoretically, it might easily be assumed that the division of the work of the kidneys is such that each takes an approximately equal part in the excretion of the products of tissue metabolism, and that both together possess about as much healthy tissue as one normally functionating kidney. Under such circumstances the loss of one working half by operation might be expected to be followed by an insufficiency of the remaining half. In such a case the determination of the freezing-point of the blood might give normal figures, which, however, would bear relation to the work of the two kidneys. That such errors may be avoided, and the presence of a second kidney proved, ureteral catheterization should always be performed, and we have catheterized whenever it was possible. According to our numerous experiences, a normal freezing-point generally indicates a second kidney, which, if not perfectly healthy, is nevertheless capable of functionating. Invariably, if the normal amount of urea was present in the urine, and a normal $\triangle$ was found on examination, then, also, the freezing-point, δ, of the blood was always normal. The freezing-point of the blood was also found normal when one kidney was present, which, though not entirely healthy, was nevertheless equal to its duties because of the preponderance of healthy tissue. This, for example, we observed in a patient with only one hypertrophic kidney, who had an adrenal sarcoma. The kidney functionated perfectly, δ being equal to 0.57. The absence of the other kidney was shown by ureteral catheterization. Operation confirmed the diagnosed conditions; a nephrectomy was, of course, contraindicated. Also, in a case of injury of the kidney, in which there was a congenital absence of the other organ, the freezing-point was normal, since an adequate amount of renal tissue still remained. We have had several similar experiences. I call special attention to these cases, as they prove that δ speaks only for an adequate renal function, and that catheterization of the ureters must demonstrate the presence of the other organ, and should therefore never be neglected.

4. A lowering of the freezing-point of the blood indicates that the kidneys are not entirely equal to the required work. If δ falls to 0.6°, according to our experience nephrectomy should not be undertaken, and nephrotomy only when absolutely necessary. Nephrectomy may follow only when the freezing-point has improved and reached the normal. In case this does not occur, nephrectomy should not be considered. It is, of course, possible that after further experience the limits of what may be regarded as a normal freezing-point will be broadened. The numerical value of 0.6° obtained by a correct and perfect cryoscopy may be entirely subjective. At any rate, according to our experience up to the present time, this figure represents the limit beyond which the removal of a kidney seems dangerous, and therefore is not recommended by us.

In five cases in which nephrectomy was performed, notwithstanding a lowering of the freezing-point below 0.6°, death occurred after a short time, accompanied by uræmic phenomena. The other kidney was found extensively diseased at the autopsy. In about three hundred cases in which the freezing-point was lowered, below 0.6°, the further course of the disease, the post-mortem examination or nephrotomy proved the correctness of our assumptions. In these cases we had to deal with bilateral disease of the kidneys (contracted kidney, parenchymatous nephritis), bilateral pyelonephritis, and bilateral tuberculosis, with tumors of both kidneys, bilateral renal calculi with and without complete anuria, bilateral cystic kidneys, and with prostatic hypertrophy complicated by secondary disease of the kidneys.

PROGNOSTIC SIGNIFICANCE OF CRYOSCOPY IN CHRONIC NEPHRITIS

In many cases which apparently were progressing favorably, an aggravation of the renal disease could be demonstrated by a progressive lowering of the freezing-point, and long before the general condition of the patient called attention to the severity of the disease, an absolutely unfavorable prognosis could be made, which was always confirmed by subsequent events. It is in just these various forms of chronic renal disease which came under our care on account of hemorrhage or other rea-

sons, that we could determine the progressive lowering of the freezing-point step by step, through intervals of weeks, and foretell the result that might confidently be expected, notwithstanding the subjective sensation of well-being and good appearance of the patient. In carefully performed cryoscopy of the blood we possess a very important adjuvant from a prognostic standpoint.

RESULTS OF KIDNEY OPERATIONS

In regard to the successful results obtained by the modern methods of examination in diseases of the kidney, the conditions are as follows:

The total number of operations on the kidney which we have performed amounts to 404.

189 nephrectomies.
133 nephrotomies.
6 resections.
45 fixations.
11 decapsulations.
12 incisions of paranephritic abscesses.
8 ureteral implantations.

Of these, 51 died as a result of operation, which represents a mortality of 12.6 per cent. If we separate the fatal cases occurring before from those occurring after the introduction of the newer methods of examination, we can show much more favorable results. Of 189 nephrectomies, 41 were performed before we used the modern examination methods, with 15 deaths; a mortality of 36.5 per cent. After the introduction of ureteral catheterization and cryoscopy, we performed 148 nephrectomies, with 10 deaths; a mortality of 6.7 per cent. If in three cases the result of the preliminary examination by the modern methods showing a bilateral disease, especially the lowering of the freezing-point of the blood, below 0.60°, showing an insufficiency of the kidneys, had been heeded, these three deaths might have been avoided, when the mortality of our nephrectomies would have amounted to only 4.7 per cent.

If we examine briefly the separate groups of cases, we find the following:

I. 22 *Hydronephroses.*

Thirteen nephrectomies, with 13 recoveries. Ten nephrotomies (one followed by secondary nephrectomy), with 8 recoveries and 2 deaths, one of these resulting from a perforating ulcer of the duodenum, three weeks after recovery from the kidney operation and independent of the same. One death resulted from myocarditis eleven days after the operation. One case which I included in our former statistics I now include among the pyonephroses.

II. 67 *Pyonephroses.*

Forty-three nephrectomies (6 of which were secondary), with 37 recoveries and 6 deaths.

Thirty nephrotomies, with 26 recoveries and 4 deaths.

Of the six deaths following nephrectomy, two date back to the time before the application of ureteral catheterization and cryoscopy. They succumbed to uræmia, resulting from disease of the second kidney.

Two patients died of uræmia because they were operated on in spite of freezing-points of 0.60° and 0.64° and demonstrated disease of the other kidney. These deaths might have been avoided, as has already been explained at length.

One patient died of abscess of the lung and subphrenic abscess, and another of pulmonary embolism.

One of the deaths following nephrectomy was due to sepsis.

Three patients were admitted in a uræmic condition, δ 0.61° to 0.63°, one patient showing a congenital absence of one kidney, the remaining organ being almost completely destroyed and pyonephrotic. In none of these cases was nephrotomy followed by permanent improvement. After temporary improvement, death occurred in from ten to eighteen days.

Our resections of the kidney I have grouped with the nephrotomies.

III. *Renal Calculi.*

Eighty-one operations for stone in the kidney were performed; 57 nephrotomies, with 8 deaths; and 24 nephrectomies, 6 of which were secondary, with 2 deaths. Among these 81 cases there were:

(*a*) 33 cases in which the stone was not infected, with 33 recoveries.

(*b*) 32 cases, stone infected, with 29 recoveries and 3 deaths.

(*c*) 16 bilateral infected stones, with 9 recoveries and 7 deaths.

One resection of a horseshoe kidney containing a stone. Recovery.

Among the cases operated on for bilateral stone, five were already uræmic at the time of admission, several having an anuria of several days' duration. Four patients showed a freezing-point δ of 0.63° to 0.66°. Two date back to an earlier time. On two nephrotomized patients a secondary nephrectomy had to be done; one patient recovered and one died. This latter case is the one described in detail, in which a bilateral disease had been positively demonstrated and a δ of 0.62° found, and on whom nephrectomy was performed against our wish, in face of a probably fatal outcome. Before the introduction of the modern methods of examination, seven cases were operated on, with one death; subsequently, sixteen cases, with one death.

IV. *Tuberculosis.*

Eighty cases of tuberculosis of the kidney were subjected to operation. There were 76 nephrectomies (of which 6 were secondary), with 5 deaths.

Ten nephrotomies, with three deaths.

Of the 5 patients dying after nephrectomy, 3 deaths occurred before the introduction of the modern methods of examination (embolism, peritonitis, and uræmia, in consequence of absence of the other kidney); while after the introduction of ureteral catheterization, cryoscopy, etc., there were only 2 deaths following 65 nephrectomies (one from sepsis, the other from pneumonia). The kidney which had been left was healthy. Of 10 nephrotomies, 3 were performed in presence of disease of both kidneys. These patients died after seven, ten, and twelve weeks of tuberculosis and uræmia.

Of the deaths which occurred later, three took place after four weeks to three months, as a result of miliary tuberculosis; there was also one death due to phthisis, and another from tubercular meningitis. In this latter case an autopsy was made, and the remaining kidney was found entirely healthy, having also shown itself clinically to be functionally competent. I will report more in detail, in another paper, on the time needed for recovery in the remaining cases. The total mortality of all of our cases operated on for tuberculosis amounts to ten per cent, while that of the 65 nephrectomies after the introduction of the modern methods was only three per cent.

V. *Tumors.*

Of 30 operations for the removal of tumors there were:

22 nephrectomies, 7 nephrotomies.

Of 11 nephrectomies performed before the application of the modern methods, 9 died and 2 recovered.

Of 11 nephrectomies after introduction of the modern methods, 2 died and 9 recovered.

Of 7 nephrotomies, 3 died; one as a result of bilateral cystic kidney: δ before operation being 0.71°. Twice there were malignant tumors of both kidneys.

VI. *Various Operations.*

Twelve nephrectomies with one death and twenty-three nephrotomies with four deaths were performed for the cure of ureteral fistulæ, on account of injuries, nephritis, etc.

While, formerly, we had to deplore a fatal issue on account of absence or insufficiency of the other organ in 6 cases, we have not had one kidney death among 148 cases since the introduction of the newer methods of diagnosis. Death occurred in three cases in which nephrectomy was performed, notwithstanding the fact that disease of the other side was shown to exist, and a lowered freezing-point, and consequent insufficiency demonstrated.

The demonstration of the existence of bilateral disease by means of the ureteral catheter is insufficient for the diagnosis of the functional ability of the kidney. We have frequently shown in cases of tuberculosis of the kidney and in cases of pynephrosis by means of the ureteral catheter, that, besides the disease of the one, the second kidney also was diseased, but we have nevertheless undertaken nephrectomy without untoward results, if cryoscopy showed the existence of an adequate functional activity.

By the application of the old and tried methods of examination, in combination with the newer methods, especially the Röntgen ray, the ureteral catheter and the various methods of determining the sufficiency of the kidneys, among which cryoscopy, if properly managed, appears to me to be the simplest procedure, we are able to make a diagnosis and prognosis of renal disease with a great degree of accuracy, and even with approximately absolute certainty. One method alone will not give sufficient assurance in the diagnostic consideration of a

case, while the careful conclusions drawn from the results obtained from the largest possible number of diagnostic helps at our command will almost always lead us to the right point.

Among the methods of determining the kidney function, cryoscopy has proved itself of the greatest value, and with the proper care in technique has never failed us in over one thousand examinations. Cryoscopy is not intended to displace any other method, especially not ureteral catheterization, but even in those cases where the other methods are inadequate it is of complementary value, and has so proved itself. On account of its relative simplicity and its accuracy in determining the renal function, I hope that this valuable method may receive a wider recognition and a more universal application.

SUPRAPUBIC CYSTOTOMY WITH RETROGRADE CATHETERIZATION IN TRAUMATIC RUPTURE OF THE URETHRA

By ARCH DIXON, M. D., Henderson, Kentucky

IN pursuit of knowledge of the subject of traumatic rupture of the urethra, one is particularly struck with the dearth of literature upon a condition of such great importance and interest to the general practitioner. It is strange indeed that this accident, belonging as it does to emergency surgery, demanding quick and urgent relief, should, if mentioned at all, be dismissed with a few paragraphs in a general way, with an utter lack of detail as regards the operative procedure and technique to be adopted in so grave an injury. Most authors on operative surgery are satisfied to notice in a general way its causes, diagnosis, prognosis, and treatment, perhaps sufficient for the expert surgeon, but totally inadequate in a practical way to the wants of the general practitioner. The advice given by the majority of authors is, the diagnosis having been made, to catheterize, if possible, to relieve distention — otherwise, suprapubic puncture; urethrotomy — bringing the torn ends of the urethra together and stitching them — in complete rupture; in incomplete rupture, the leaving of a sufficiently large catheter in the bladder to prevent urine leakage into the urethra for four or five days, and the subsequent passage of a sound to prevent stricture. *As a last resort*, in complete rupture, and when the proximal end of the urethra cannot be found, they say that suprapubic cystotomy and retrograde catheterization *may be* resorted to.

"The fate of a patient, the subject of ruptured urethra, either of traumatic or pathologic origin, depends on a correct early diagnosis and on the receipt of prompt surgical aid. Every general practitioner should be prepared to recognize the accident and to relieve the mechanical difficulties in the way of spontaneous urination, as tension caused by the extravasation of blood and urine is one of the principal causes of more remote serious consequences. Successful catheterization is possible only in cases in which the rupture is incomplete. In the complete variety the use of the catheter is seldom, if ever, attended with success, but serves nevertheless as a means of diagnosis" (1). In the incomplete variety, catheterization is often exceedingly difficult, and in the hands of the inexpert the tissues are frequently further insulted and the laceration further extended. Lydston (2) says: "The subject of urethral traumatisms, while strictly surgical, is very important to the general practitioner. He is usually first upon the scene after injuries, and may be led to believe that certain cases are of trifling importance, when they urgently demand the immediate attention of an expert surgeon. It is by no means serious swelling, pain, and retention of urine alone that require careful surgery. A knowledge of the possible immediate dangers, ultimate results, and proper treatment of traumatisms of the urinary canal is of the greatest importance, not only because of the immediate gravity of many

cases, but of the possible remote, yet serious, results." He classifies the possible results of urethral traumatism as follows: Hemorrhage, retention of urine, extravasation of urine, sloughing, false passages, urethritis, pus-infection and abscess, urinary fistula, permanent curvature of the penis, intractable stricture, fatal sepsis."

I claim, in all cases of traumatic rupture of the urethra, whether complete or incomplete, where it is impossible to introduce a catheter into the bladder after careful trial, that the performance of suprapubic cystotomy with retrograde catheterization immediately, or as soon as possible, will, in a large proportion of cases, not only prevent these possible and remote results, but that it is the proper course to pursue.

The advantages to be derived from it are so patent as hardly to admit of argument. From a surgical standpoint the anatomy of the urethra, as given by Guyon, quoted by Mastin (3), is full of practical points. Guyon divided the urethra into six regions:

1. The navicular region, which corresponds to that portion of the urethra surrounded by the glans penis and extending from the meatus externa to the corona glandis.

2. The penile region proper, reaching from the termination of the navicular region to the entrance of the urethra into the scrotum.

3. The scrotal region, including, of course, all that part of the urethra contained within the limits of the scrotum.

4. The perineo-bulbar region, which extends from the posterior limit of the scrotal sac to the passage of the urethra under the pubic arch.

5. The membranous region.

6. The prostatic region.

These regional divisions, he declares, are amply jus ified by clinical experience and certain distinguishing features.

In connection with the navicular portion is to be remembered the care to be exercised in the employment of instruments, presenting them to the inferior and not to the superior wall, as is the rule in the other regions, the arresting of extraneous bodies, and the frequency of cicatricial strictures. The penile is the portion which is the most movable, the most superficial, and the least fixed. In the scrotal portion, which is deep and more fixed, stricture is comparatively rare; foreign bodies are seldom arrested; and when it becomes necessary to open it — for instance, during the swelling and thickening attending abscesses, or urinary infiltration, when it is difficult to trace by the finger an instrument introduced into the canal — the median line is the most convenient guide. The perineo-bulbar portion is really deep and fixed; it is the seat of election for blennorrhagic contractions, and here, too, traumatic strictures from deep contusions and lacerations of the urethra are more frequently encountered. Guyon directs attention to the fact that the inferior wall is extensible, soft, and depressible, and is subject to variations of both form and length; hence the important point to be borne in mind by the surgeon is that in catheterism he should either follow exactly in the curve of the superior wall or modify the direction of the urethra; and to determine the adaptability of the canal to instruments, anatomy must be depended upon to indicate to us the normal direction of the urethra and the limit of modification it will bear without sustaining a lesion; and here it is to be especially remembered that the first part of the urethral curve — that extending from the suspensory ligament to the entrance into the membranous division — is, above all the rest, susceptible of modification and change of direction. The urethra has no lateral flexions, presenting neither bends nor flexuosities, but is exactly parallel with the median line. Nothing, however, is easier than to produce bends in the entire spongy region, particularly in the bulbar portion.

It should never be forgotten, in making examinations for stricture, or indeed in any urethral instrumentation, that the elasticity or distensibility of the urethra resides for the most part in the spongy portion, as is clearly demonstrated by erection; and this elasticity belongs in the greatest degree to the inferior wall, which permits of easy distention or elongation, and changes its dimensions and form with notable facility, while the superior wall yields with much more reluctance, and offers a certain resistance to all agents tending to depress or elongate it. This difference increases with age, and obtains especially in senile urethra. "The

surgical interest of all this, in its relations to the treatment of strictures, or traumatisms of the urethra, is evident, since the distensibility of the inferior wall is brought into play even by a moderate force, and the surgeon cannot count on its resistance. It glides before an instrument, and cannot serve to guide it; it cannot be incised with any accuracy or precision; it lacerates or ruptures when surprised by distention; and it yields rapidly and easily to a mechanical pressure testing its distensibility. It should be noticed, too, that this elongation of the canal is chiefly at the expense of the anterior urethra. Again, the spongy portion does not yield equally in all its parts, since it has been shown that of the different regions the perineo-bulbar is the most distensible. The inferior wall of the urethra can then be considered as normally longer than the superior surface. The term 'surgical wall,' proposed for the upper wall by Guyon, would seem to be merited, because it offers the shortest route to the bladder; it is the most regular and constant as to form and direction; presents the smoothest and firmest surface; is the least capable of gliding before an instrument or of being modified by mechanical pressure; offers the greatest resistance to rupture and penetration; is less intimately connected with important structures; and is the least vascular of the two walls."

Owing to the comparative rarity of rupture of the pendulous portion of the urethra, I shall confine my remarks to traumatisms which affect the perineal portions, the large majority of which are caused by falls upon the perineum. In a fewer number of cases the rupture is due to blows, kicks, or other violence on the perineum when the thighs are separated, the perineum protruding backward while the body is inclined forward.

The mechanism of these ruptures has long engaged the attention of authors, and contradictory opinions have been advanced. The theory of Velpau and Franc, that the urethral lesion was the result of a crushing of the membranous portion of the urethra against the lower border of the pubic arch, or of its bulbous portion against the anterior surface of the pubis, has long been accepted by the profession. In a paper which appeared in 1876, Cras (4) attempted to establish a new theory. According to him, "the urethra, fixed by the triangular ligament about two centimeters from the lower border of the symphysis, could not possibly be crushed against it; it could, at best, only be compressed against the face of the pubis, which, in the erect position, makes an angle of from 30° to 35° with the horizon, but this would be a rare mechanism." According to Cras, the contusing force scarcely ever comes directly upon the line of the perineum; it acts most frequently upon one of its sides, forcing the urethra away laterally, so that the latter is squeezed between the contusing body and the highest portion of the descending ramus of the pubis. There exists at this point a sharp ridge, which can be felt through the skin, and which rises several millimeters above a plane resting on the anterior face of the symphysis. On the other hand, A. Poncet of Lyons (quoted by Ashhurst) concludes from investigations made upon the cadaver with Ollier, that the theory of Velpau (crushing against the pubis) is applicable to lacerations of the bulbous portion of the urethra. As to lacerations of the membranous portion, they are the result of a true section of the canal against the sharp edge of a special ligament (the transverse ligament of Henle), a kind of fibrous bridle with an acute edge, slightly concave, extending transversely between the two descending portions of the pubis. The urethra, in the experiments of Ollier and Poncet, was found to be divided at this level, but only at the expense of its upper wall. Finally, quite recently, Terillon, taking up, in turn, this question, has arrived at the following conclusions, likewise based on experiments on the cadaver:

1. Falling astride upon a narrow body, easily capable of being included in the subpubic angle, causes rupture of the urethra, according to the mechanism pointed out by Cras (crushing of the urethra upon the sharp edge of the ischiopubic ramus), and the rupture is situated at the middle portion of the bulb, on the lower lateral wall of the canal.

2. When a fall takes place astride on a voluminous body, which is with difficulty included under the pubic arch, the urethra is crushed against the anterior face of the pubis, or even against the lower edge of this bone, and the

rupture is situated in the anterior portion of the bulb, or in the spongy body, and involves the lower wall of the canal. Blows on the perineum produce results analogous to the preceding.

"It remains to be said that lacerations of the urethra may be produced by fracture, or even displacement of the pubis; these are nearly always confined to the membranous portion, owing to its being fixed by the triangular ligament. For convenience' sake, rupture of the urethra may be divided into two classes, complete and incomplete. Incomplete rupture occupies only a part of the circumference of the urethra; very exceptionally the lesion is reduced to a simple perforation; as a rule, the walls are extensively lacerated, but along the upper wall there remains a strip of sound tissue which joins the two ends, and which is very important as a guide in catheterization and in an operation to search for the posterior end. The space between the torn ends of the urethra, at the point of solution of continuity, will be found to be filled with blood-clots. In complete rupture, the urethra is divided transversely, the two ends are retracted, one anteriorly and the other posteriorly, the mucous membrane of the posterior end is curled upon itself, and completely fills and obliterates the lumen of the canal. These ends may be separated by a distance of from two to four centimeters. Between them is a pocket filled with blood-clots, further interfering with the passage of urine from the bladder, or of a catheter into the bladder to relieve distention. This pocket communicates with the tissues of the perineum, and, later on, is filled with a mixture of blood, pus, and urine. The rupture is nearly always complete in the membranous portion, owing to the thinness of the walls and the poor resistance of the surrounding muscles. It may be said that it is altogether in exceptional cases that the mucous membrane is simply frayed or slit. Should there be a fracture of the pelvis, the displaced fragment may drag with it one of the divided edges of the urethra, causing a lateral displacement of the two ends, which will make the search for the posterior segment extremely difficult. The question of the seat of the lesion in ruptures of the urethra has been much discussed" (5).

According to Franc and Reybard, a rupture resulting from a contusion of the perineum is most frequently situated in the portion of the urethra which extends between the triangular ligament and the suspensory ligament of the penis. From information gathered at autopsies, and examinations made at the moment when perineal incisions had been practised, Cras came to the following conclusion: Every time that the examination was made carefully, the bulbous region was found involved. Guyon, in his report on the paper of Cras, adopts the same opinion. Finally, Terillon, relying upon the results of autopsies, upon explorations carried out by surgeons during operations of urethrotomy, and upon his own experience, arrives at altogether analogous conclusions. In contusions of the perineum, ruptures are situated most frequently at the level of the middle or anterior portion of the bulb. There always remains in front of the triangular ligament a strip of the canal, having a length which varies from one to three centimeters.

Ruptures of the membranous portion are almost constantly accompanied by fractures or dislocations of the pelvis. Those of the prostatic region are absolutely exceptional. Recognition of the extent of the rupture is still more interesting than that of its seat. Is the rupture complete or incomplete? What wall has escaped the traumatism? These two questions are of capital importance in regard to treatment, in regard both to the introduction of a catheter and to the search for the posterior end of the divided urethra.

(6) "The anatomical peculiarities of the part explain the usual course of urinary extravasation. The urethra may, for example, be divided into four regions. In all that part from the meatus to the scrotal curve, extravasation is accompanied by a swelling and discoloration of the penis, greatest in the immediate neighborhood of the injury. In the region included between the attachment of the scrotum and the anterior part of the bulb, the course of extravasated blood or urine is governed by the attachments of the deep layer of the superficial fascia, or fascia of Colles. This is attached to the side of the pubic and ischiatic rami, and behind, after dipping over the edge of the transverse

perineal muscles, it is attached to the base of the triangular ligament, becoming continuous, at the posterior edge of that ligament, with the pelvic fascia, where it blends with the posterior layer of the triangular ligament. This fascia of Colles (see plate) is continuous with the dartos tissue of the scrotum, and extends upward to the abdomen, being attached in the middle line to the symphysis and on the outer side to the fascia lata, just beyond Poupart's ligament, leaving a space between the symphysis and the spine of the pubes, to which it is not firmly fixed; it then becomes continuous with the deep layer of the superficial fascia of the abdomen. Extravasation of urine occurring through laceration in the bulbous region of the urethra will first follow the space inclosed by this fascia in front and below, and by the anterior layer of the triangular ligament posteriorly, and as it cannot reach the ischiorectal space on account of the attachment of the fascia to the base of the ligament, and cannot reach the thighs on account of the insertion of the fascia into the ischiopubic line, it is directed into the scrotal tissues, and thence up between the pubic spine and symphysis until it reaches the abdomen. If the injury affect the membranous urethra alone, the surrounding structures not being involved in the laceration, the extravasated urine would be confined to the region included between the layers of the triangular ligament, and would only gain access to other parts after suppuration and sloughing had given it an outlet. The consecutive symptoms would then depend upon the portion of the aponeurotic wall which first gave way. If the injury is situated behind the posterior layer of the triangular ligament — i. e., in the prostatic urethra — the urine may either follow the course of the rectum, making its appearance in the anal perineum, or, as it is only separated from the pelvis by the thin pelvic fascia, it may make its way through the latter near the puboprostatic ligament, where it is especially weak, and may spread rapidly through the subperitoneal connective tissue.

Deaver (7) says: "Extravasated urine enters the superficial intra-aponeurotic space of the pernieum proper when the urethra is ruptured at the junction of its bulbous and membranous portions. Having distended this space, the urine passes in the direction in which it meets with least resistance — namely, into the scrotum — and thence it passes over the body of the pubis, between the spine of the pubis and the symphysis pubis, into the abdominal wall by the way of the scroto-abdominal passage. It is unable to gain access to the ischiorectal fossæ, on account of the attachment of the deep layer of the superficial perineal fascia to the base of the triangular ligament; neither can it find its way externally upon the inner sides of the thighs, on account of the attachment of the deep layer of the superficial fascia to the descending rami of the pubes and rami of the ischia; it cannot enter the pelvis, as the anterior layer of the triangular ligament is stretched across the urethral triangle as a firm resisting diaphragm. Having reached the abdominal wall, it accumulates beneath the superficial fascia in this location, being unable to pass to the anterior surface of the thigh, on account of the attachment of the deep layer of the superficial fascia of the abdomen to the deep fascia along Poupart's ligament and the outer lip of the crest of the ilium. Pus or blood within the superficial perineal interspace, if the effusion be extensive enough, will follow the same course. Owing to the density and attachments of the deep layer of the superficial fascia, there will be little or no fluctuation in the perineum in cases of extravasated urine, and in abscess only a firm and tender swelling will be present."

From the anatomical relations as given, and from the conclusions arrived at by experiments on the cadaver, the diagnosis of the seat of ruptures in the deep urethra should not be difficult. In fact, it may be stated that in every case in which a contusion of the perineum causes a rupture of the urethra, the rupture will be found in the bulbous portion of the canal, and that in all cases when the rupture follows a fracture of the pelvis, the rupture will be found in the membranous portion. The principal symptoms of rupture of the urethra are pain, hemorrhage from the meatus, and retention of urine. These are present in every case, varying in degree, owing to the extent and gravity of the injury. Bleeding from the meatus is *prima facie* evidence of a solution of the continuity of the mucous membrane of the urethra. Retention may be due to spasmodic contraction of

the membranous portion of the urethra. In this case it is of temporary duration, and is usually present, in not very grave cases, for a few hours after the inception of the injury. Swelling at the seat of contusion, and blood-clots from extravasated blood between the two ends, may also cause it, but the main factor in its production is the crumpling and retraction of the proximal end of the lacerated mucous membrane, analogous to the phenomenon which takes place when a blood-vessel is torn apart, when the internal coats of the artery retract, filling its lumen and preventing hemorrhage.

Mild cases of rupture of the urethra, in which there is little pain, slight bleeding from the meatus, and little difficulty in micturition, require no energetic surgical interference; rest in bed, light diet, and local applications to the seat of injury generally suffice. This treatment should be followed later on by the systematic passage of a steel sound to prevent the formation of stricture. Stricture is the ultimate result of all varieties of rupture of the urethra, and steps taken to prevent its formation cannot be too strongly insisted upon. In cases of incomplete rupture, where there is great pain, more or less hemorrhage from the meatus, great difficulty in urination, or probably retention for several hours after the injury, it is best to pass a soft catheter into the bladder, allowing it to remain for a number of days for drainage; should extravasation of urine occur — which is not likely — an incision should be made to relieve it. Catheterization should be done with extreme caution, remembering to make the catheter hug the upper or "surgical wall." This can be done by passing a small stiff stylet into the soft catheter, giving it the proper curve for a guide, and withdrawing the stylet after the catheter enters the bladder. If, after careful manipulation, it is found impossible to introduce a catheter, and retention persists, it has been my custom to do suprapubic puncture for the relief of distention, to be followed by enlargement of the puncture and retrograde catheterization.

In complete rupture the injury is grave, hemorrhage is generally profuse, and the pain exceedingly severe. Retention, which begins at once, is persistent, and soon demands urgent relief. Catheterization is impossible, and it is useless to waste time in any persistent attempt to accomplish it; moreover, there is great danger of adding largely to the extent of the injury. The situation is one which demands active and immediate means for present relief and for the prevention of grave sequelæ; viz., extravasation of urine, sepsis, sloughing, infiltration of urine, blood and pus, the formation of scrotal and perineal fistulæ, and intractable stricture.

The following cases will illustrate the measures pursued by me. These measures have served me well, and I have reason to believe that they will be beneficial to others.

Case 1. In October, 1886, at Dekoven, Kentucky, Mr. N., railway conductor, aged 35, in attempting to stand upon the back of a seat in a passenger-coach to close a ventilator, slipped and fell astride of the back of the seat, rupturing the deep urethra. He was immediately placed in charge of Dr. Long of Dekoven, and I, being at that time surgeon for the road, was wired for. Arriving in Dekoven about six hours after the accident, I found the patient suffering much from retention, blood was still oozing from the meatus, and there was swelling and ecchymosis in the perineum. Dr. Long had attempted to relieve the retention by catheter, without success. I also failed to introduce a catheter. Rupture of the urethra was diagnosed. Suprapubic puncture was done by trocar, and the canula left in situ, controlled by adhesive strips, and the patient taken by train to Henderson, Kentucky. Under anæsthesia, an incision was made in the perineum, at the point of injury. Dividing the skin and superficial fascia, the wound cavity was entered, the clotted blood was turned out, the wound cleansed, and search begun for the divided ends of the urethra. The anterior end was found without much difficulty, but not so the other. A long, careful, and tedious search was made for it, without success. The suprapubic puncture wound was then enlarged sufficiently to admit the index finger of the left hand, the vesical orifice was found, and, guided by the finger, an ordinary sound was passed through it into the urethra, emerging into the perineal wound, carrying before it the torn end of the urethra, very like the straightening out of the inverted end of a glove finger. The torn ends were caught by dressing-forceps, brought together, and stitched with fine iron-dyed silk across the upper wall. A soft catheter was then passed into the posterior urethra, but not into the bladder, and the remaining portions of the torn urethra stitched over the catheter, and at the same time the perineal wound was closed. A piece of rubber tubing was inserted into the bladder, through the suprapubic opening, for drainage. The wound was closed by suture around the tube, which was held in place by three stitches passing through its wall, reinforced by adhesive strips. The patient was put to bed, and his

Superficial muscles, arteries, and nerves of the male perineum. Reproduced from Deaver's *Surgical Anatomy*, vol. ii.

recovery was uneventful. In five days urine was passing through the urethra. On the sixth day the catheter was removed and urine was voided in the natural way. The siphonic drainage of the bladder, through a rubber tube passing into a jar of carbolized water beneath the bed, was all that could be desired. Systematic use of the sound was enjoined upon the patient. In 1896, ten years later, I saw Mr. N., and there was no stricture; he still made occasional use of the sound (8).

CASE 2. J. B., aged 27, in February, 1888, while standing on the back of a chair to hang a picture, fell astride of it, producing complete rupture of the urethra in the bulbous portion. I saw the patient shortly after the accident; he had fainted from pain and shock, and was much depressed. Blood was oozing from the meatus, and there was retention, with great vesical tenesmus. Morphia and atropia, hypodermatically, greatly relieved present symptoms. After very careful

effort to introduce a catheter, the patient was prepared and was operated on as in case 1.

Incision through skin and fascia of perineum, at point of injury where bulging was greatest; blood-clots were turned out, and search made for the posterior end, without success. A suprapubic opening was then made in the bladder, only large enough to admit the left index finger. With the finger as a guide, the vesical orifice was found, and a sound was passed through it into the urethra. As before, the lacerated and retracted mucous membrane was straightened out by the sound, and the further steps in the operation were comparatively easy. The two ends were united by fine silk over the catheter, which, as in the previous case, was passed through the posterior end into the urethra, but not into the bladder; drainage of urine was through a rubber tube fixed in the suprapubic opening. It was deemed best not to close entirely the perineal wound, as the tissues were much bruised and insulted. Recovery was not as rapid as in the first case; there was considerable slough, and the perineal wound healed by slow granulation. Mr. B. is living to-day, and has no stricture, owing to a long and systematic use of the sound (9).

Case 3. Almost identical with case 1. In September, 1893, a negro, male, aged 23, hanging tobacco on a scaffold in a barn, slipped and fell astride a portion of the scaffolding. The urethra was ruptured in bulbous portion. Suprapubic cystotomy was done, with retrograde catheterization. In this case the catheter was passed into the bladder, and left there for drainage, and the suprapubic opening was closed by suture. Recovery was good. Subsequent history unknown.

Case 4. Willie J., aged 10, in September, 1896, fell astride of a plank fence. Pain, hemorrhage from the meatus, and swelling of the perineum were present. Rupture of the urethra was diagnosed; treatment was suprapubic cystotomy, with retrograde catheterization, perineal section, stitching the divided ends of urethra with fine catgut, and closure of perineal wound. In this case the passage of the catheter into the bladder was attended with so much difficulty that Stewart's method (10), clipping off the blind end of the catheter and forcing it over the point of the sound which protruded through the posterior end, and withdrawing the sound through the deep urethra, carrying the catheter with it into the bladder, was adopted. This case did remarkably well. In seven days the catheter was withdrawn; a sound was introduced daily for nearly two years, and afterward at intervals of three or four days for two years more. There was no stricture, and there is none to-day.

The difficulty of doing external perineal urethrotomy without a guide can only be appreciated by those who have attempted it. Even in the hands of the expert surgeon, it is admittedly one of the most troublesome and formidable operations in surgical practice. My experience has not been a large one, but I have no hesitancy in saying that suprapubic cystotomy with retrocatheterization greatly simplifies this difficult operation. The passage of a sound through the bladder into the posterior urethra down to the stricture, and the introduction of a sound through the anterior urethra down to the stricture, maps out the field of operation, the incision and dissection being made in the raphe between the ends of the sounds, which serve as guides.

Suprapubic cystotomy was first done by Pierre Franco, a surgeon of Provence, in 1556. Dr. Brainard, according to Senn (11), was the first to suggest retrograde catheterization through a suprapubic opening.

As remarked in the beginning of this paper, there is a dearth of literature upon this subject. M. Tillaux of Paris (12) describes a case of traumatic stricture operated upon by him, as follows: "A man fell astraddle of some hard substance, from which there resulted extravasation of urine, fistula, and stricture. External urethrotomy failing to disclose the posterior opening of the urethral canal, suprapubic cystotomy was resorted to, after which a finger introduced into the bladder directed a metallic sound into the urethra. This was then made to project into the perineum, and acted as a guide for the operation of external urethrotomy."

Weir (13), in a paper, "Treatment of Ruptured Urethra, by Immediate Suture and Bladder Drainage," urges immediate suture of the torn urethra and suprapubic cystotomy, with intermittent siphonic drainage of the bladder. He states that retrograde catheterization may be made to find the posterior end of the divided urethra. Stewart (14) advocates strongly the suprapubic method. He says: "The comparative advantages of the perineal and suprapubic methods of treating rupture of the urethra are overwhelming in favor of the latter — a fact which will become obvious when we consider the technique of the latter operation. The scrotum and perineum are first incised, to give vent to the extravasated urine; the incision in the perineum will enter a pocket containing bloody urine. The distended bladder is opened above the pubes by an incision just large enough to admit the index finger, which should at once feel for the vesical orifice of the urethra. A medium-sized steel sound is insinuated by the side of the finger and into the

vesical orifice of the urethra; the finger should then be withdrawn from the bladder, and the sound thrust along the deep urethra until the tip appears in the perineal incision previously made for the extravasated urine. Over the projecting tip of the sound a rubber tube — or, more conveniently, a soft catheter with its blind extremity snipped off — is forcibly thrust, and the sound, carrying the catheter with it, is withdrawn from the deep urethra into the bladder. The catheter is then detached from the tip of the sound, and the latter is passed through the anterior urethra until the tip likewise presents in the perineal incision; the end of the cathether which projects from the perineal wound is fitted over the tip of the sound, which is withdrawn from the urethra, thus threading the catheter through the entire length of the urethra, where it is retained *in situ* by thrusting a safety-pin through it and one of the lips of the meatus. If desired, the torn ends of the urethra may be approximated over the catheter by means of catgut sutures. The catheter should be retained in the urethra from five to six days, after which the periodic introduction of full-sized steel sounds should be practised to prevent stricture formation."

I wish to repeat, that in all cases of traumatic rupture of the urethra, whether complete or incomplete, when it is impossible to introduce a catheter into the bladder after careful trial, the performance of suprapubic cystotomy with retrograde catheterization immediately, or as soon as possible, will, in a large proportion of cases, not only prevent possible and remote results, but *that it is the proper course to pursue.* The advantages to be derived from it are so patent as hardly to admit of argument. The operation is not a difficult one, and should be within the scope of every well-equipped general practitioner. It simplifies and renders comparatively easy a most difficult and trying surgical situation. It does not add to the danger or gravity of the case, but, on the contrary, diminishes the present danger and prevents the possible remote yet serious results.

In 1888, in a paper entitled " Surgical Treatment of the Urinary Bladder and of the Urethra " (15), I said: " In all cases of rupture of the urethra, where it is impossible to find the posterior opening, I should unhesitatingly resort to suprapubic cystotomy with retrograde catheterization." I am still of that opinion.

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TEMPERATURES OCCURRING DURING THE PUERPERIUM [1]

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IN discussing this subject, of such interest to the obstetrician, so obscure in its ætiology, and so puzzling in its treatment, it is, of course, impossible, in the time allotted, to go into the matter fully. The bacteriology, at present so little understood, and the subject of such dispute, I shall not attempt to discuss. I wish simply to speak of some of the commoner conditions giving rise to elevations of temperature during the puerperium. It is well to remember, at the outset, that in nine times out of ten a rise of temperature during the puerperium means infection of the uterus or breasts. Only by excluding these are we justified in ascribing the temperature to other causes. Undoubtedly it is pleasanter to tell the family that the patient is suffering from malaria or nervousness, than to admit that she has a septic uterus or breast. But this we cannot always honestly do. On the early recognition of the cause of the elevation in temperature rests not only the peace of mind of the obstetrician, but the safety of the patient. Some of these causes I wish now to consider.

1. *The Reactionary Temperature.* Immediately after labor (within twenty-four hours), especially after long or difficult labors, the temperature sometimes rises to 101° F., 102° F., or 103° F., dropping again almost immediately to normal. The patient seems to be in good condition, and the rest of the puerperium is normal. This is the post-operative temperature seen so often in surgery, and is probably due in some way to the lowered resistance of the body directly after operation. It is of significance only in that it must be distinguished from sepsis, for the severest infections begin directly after labor. The short duration of the temperature will not leave us long in doubt, and no treatment is necessary.

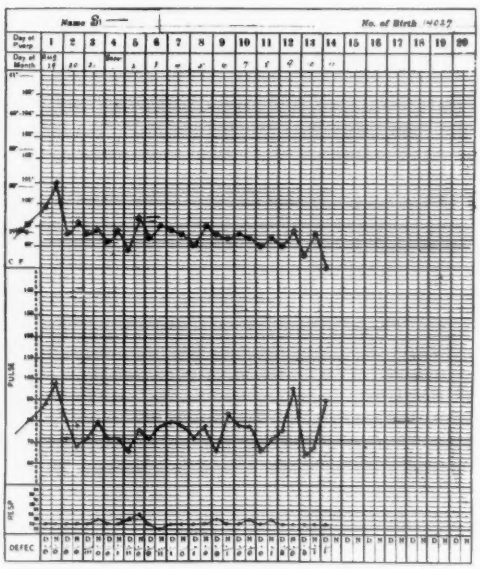


Chart I. Reactionary.

Charts I and II illustrate this. In Chart I, twelve hours after a normal labor, there is a rise of temperature to 101° F.; in Chart II, directly after a severe case of placenta prævia, there is a temperature of 103° F.; in both cases dropping at once to normal, with no further rise of temperature.

2. *Temperature from Distended Breasts.* On the third or fourth day, there is often seen a rise of temperature to 100° F. or 101° F., rarely higher. At this time the milk usually comes into the breasts, and it often does so suddenly. The breasts are distended, hot, painful, and tender. Relief of the distention at once causes the temperature to drop to normal, with a subsequent normal puerperium. Many authors deny the existence of this so-called "milk fever"; but so frequently do we see a temperature, with the distention of the breasts, disappearing with the distention, in a puerperium which is otherwise free from suspicion of sepsis, that we are forced to believe the distention to be the cause of the temperature.

Chart III illustrates this. On the afternoon of the fourth day there is a rise of temperature to 101° F. It

[1] Read before the Morris County Medical Society, at Morristown, New Jersey, March 13, 1906, through the courtesy of Dr. E. B. Cragin, in whose service at the Sloane Maternity Hospital the cases here mentioned were observed.

drops to normal the next morning, and remains so during the rest of the puerperium. This rise was coincident with distention of the breasts, and no other cause for temperature was discovered.

The diagnosis is made by the condition of the breasts and absence of other cause.

Treatment is necessary for three reasons: 1. The condition is very painful, and the pain must be relieved. 2. The baby cannot nurse from greatly distended breasts. 3. The condition lowers the resistance of the breasts to infection, and may lead to mastitis.

Treatment is promptly effective. Soften the breasts by careful massage, and get rid of the excess of milk by expression, a vigorous baby, or the breast-pump. Empty the bowels by a free saline purge. Apply ice to the breasts. And restrict the fluids.

3. *Temperature Due to Mastitis.* On the eighth day, or later, usually not much before, there may be seen a sudden rise of temperature to 101° F., 102° F., 103° F., or 104° F., often preceded by a chill. In one breast there is a tender lump. The rest of this breast and the other breast are apparently normal. The lochia and uterus are normal. The patient complains of headache, pain in the breast, and

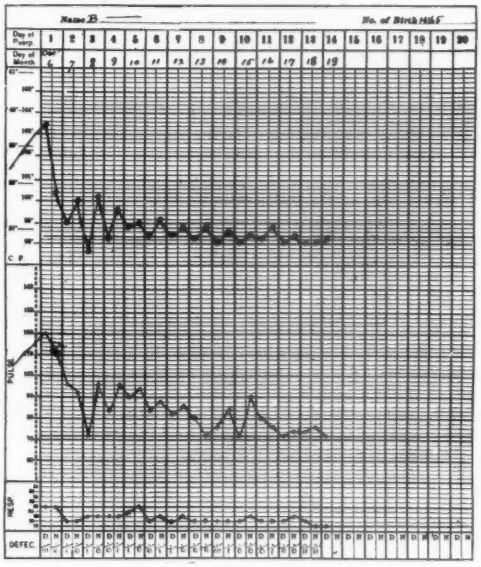


Chart II. Reactionary.

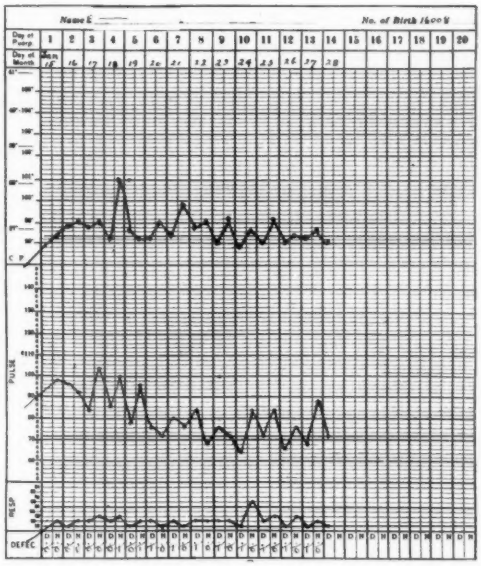


Chart III. Distended breasts. Rise coincident with distention.

feels sick, as though suffering from a severe cold. Previous distention of the breast or a cracked nipple will usually be found to have existed as a predisposing cause.

Treatment is, in the main, that of distended breasts. But it must be prompt and more energetic, and the massage must be deep, over the lump, towards the nipple, and more frequently repeated. This lump must be entirely massaged out. The routine treatment at the Sloane for a simple mastitis is deep massage and expression every two hours, aided by a vigorous baby and a breast-pump if necessary. Rochelle salts, one half ounce every half-hour for three or four doses, an ice-bag to the breast, and dry diet.

Under good treatment, within twenty-four or forty-eight hours the condition is relieved, the temperature drops to normal, and remains so. If, however, the temperature remains high after forty-eight hours, or rises again after this, it usually indicates the formation of pus — a breast abscess. The symptoms are then increased in severity. The affected part of the breast becomes tense and brawny, and massage gives the most intense agony.

Prompt incision radiating from the nipple, with drainage and tight binder, to dry up the breast, is the treatment. Breast abscess will seldom form in a mastitis, however, if the treatment is prompt and thorough. A simple mastitis can be avoided best by previous care of the breasts and nipples, preventing or curing distention and cracking. Be sure, moreover, that the uterus is not the seat of the trouble, and if there is any doubt, give a gentle intrauterine douche to make sure. It is humiliating to be treating the breasts when the uterus is at fault.

Chart IV illustrates a simple mastitis. Notice the sharp rise of temperature on the eleventh day, after a normal puerperium, with the fall the next day to normal again.

Chart V illustrates a suppurative mastitis. A sharp rise on the eleventh day, dropping to normal in thirty-six hours, but rising again twice, the breasts still being lumpy. On the eighteenth day a sudden sharp rise, with an irregular temperature for the next three days. Operation on the twenty-first day, the temperature almost immediately falling to normal. On the thirty-first and thirty-third days some pocketing of the discharge occurred, causing temperatures. A second incision on the thirty-third day caused a permanent cure.

4. *Temperature Due to Pyelitis.* Occasionally an irregular temperature of 101° F. to 104° F. occurs after delivery (and often before). Examination shows uterus, lochia, and breasts normal. Complaint is made of pain over the kidney, usually the right, and examination shows marked tenderness here, with acid urine full of pus-cells, and, on bacteriological examination, containing the bacillus coli communis. This condition is due to an inflammation of the pelvis of the kidney, caused, it is believed, by a diminished resistance from previous pressure on the ureter. Several of these cases have recently been reported by Dr. Cragin.[1]

Treatment consists in fluid diet, large drafts of water, and urotropin, usually given five grains four times a day. The condition is generally quickly relieved and only rarely needs operation.

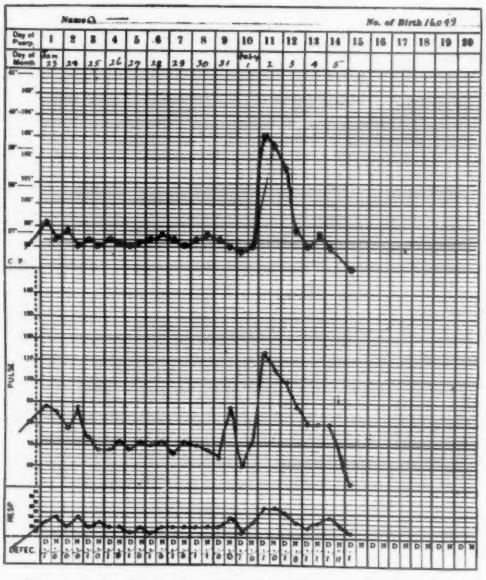


Chart IV. Mastitis. Simple. Sharp rise, and fall to normal within forty-eight hours.

Chart VI shows the temperature. The patient had a pyelitis one month before, relieved by treatment. After delivery, the temperature rose to 102° F. on the first and second days. Urine showed no casts and no pus-cells, but the bacillus coli communis. On the third day, temperature was lower and many pus-cells appeared in the urine. Urine cleared up, and the rest of the puerperium was normal.

5. Temperatures Due to Puerperal Toxæmia. By "toxæmia" we often refer to those cases of auto-intoxication caused, it is supposed, by defective liver or kidney action, as in eclampsia or albuminuria. But I am here using the term to include those cases where there is an absorption of toxins from the uterus during the puerperium. Some of these toxins are of distinctly pyogenic origin, and some are of putrefactive or saprophytic origin. Except by bacteriological examination, not always possible to make, and often unsatisfactory when made, we cannot distinguish between these conditions. I shall therefore consider them together. Some of them are due to infection and some merely to absorption of putrefactive products, from retained lochia or secundines. This is a local condition. The bacteria are confined to the uterus, and the trouble is caused by the absorption of their toxins.

In bacteriæmia, which we will consider later, on the other hand, the bacteria have escaped from the uterus, and cause trouble in the blood or tissues outside of the uterus.

[1] "Pyelitis Complicating Pregnancy." *Medical Record*, July 16, 1904.

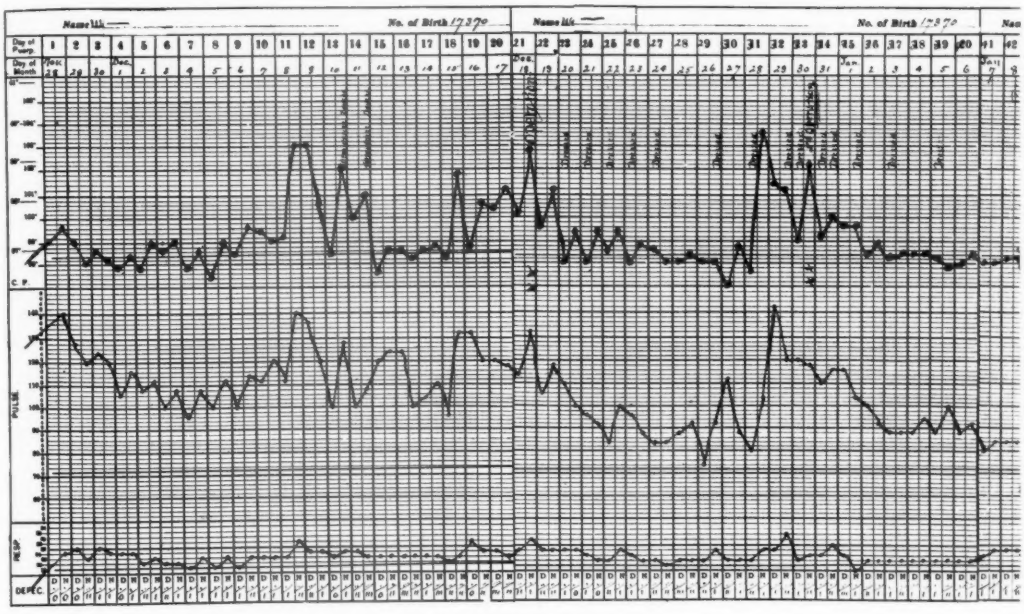


Chart V. Mastitis. Suppurative.

Temperature from Simple Retention. At any time during the puerperium there may be a rise of temperature from this cause. Examination generally shows the uterus larger and softer than it should be, with the lochia somewhat scant, and at times with foul odor. There are few constitutional symptoms. The uterine muscle has lost its tone, and products accumulate in the uterine cavity; or the cervix involutes more rapidly than the rest of the uterus, causing a stenosis.

Treatment must be directed to emptying the uterus and restoring the muscular tone. A gentle irrigation of the uterine cavity with hot normal saline solution cleans out the cavity and stimulates the muscle. Hot vaginal douches, with strychnine or quinine, are useful in restoring the muscular tone. Intrauterine douches are sometimes necessary after the temperature is normal, to prevent reaccumulation.

If intrauterine douches are of no avail in lowering the temperature, more thorough investigation must be made. The finger passed into the uterine cavity can be used to detect placental tissue or membranes not removed by the douche. These will be felt as roughened spots on the otherwise smooth surface, and must be removed by the finger or blunt curette, preferably the finger. A thorough douche will now empty the uterus, and the temperature will drop to normal, often preceded by a chill and rise of temperature, due to increased absorption as result of the treatment.

Chart VII shows a toxæmia due to simple retention, cured by intrauterine douches. A rise of temperature on the second day to 101° F., dropping to normal after a douche; 103° F. on the third day, 101° F. on the fourth day, and then dropping to normal and remaining so.

Chart VIII shows a case of toxæmia not affected by douches, but cured promptly by a digital curettage, on the ninth day several pieces of placental tissue being removed. Notice the sharp rise of temperature immediately after the curettage.

Temperatures from Anteflexion and Retroflexion of the Uterus. During the latter part of the puerperium, temperatures may occur from lack of drainage, due to flexions of the uterus. In anteflexions, the uterus, by abdominal palpation, seems in good position, but on careful

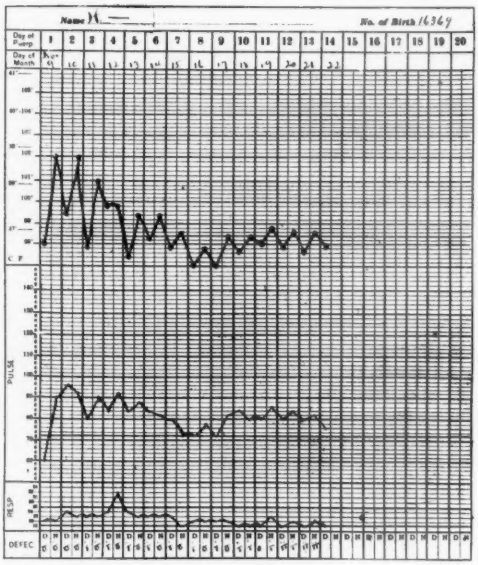


Chart VI. Pyelitis.

bimanual examination it will be found sharply flexed anteriorly. The lochia is scant, and, as a rule, there are no constitutional symptoms. The condition is aggravated by the upright position when the abdominal contents press on the uterus, increasing the flexion. Intrauterine douches will relieve the condition, but often not permanently, as there may be a reaccumulation. Dilating the cervix with the finger, and straightening out the canal, will give more permanent relief.

Retroflexions may occur at any time after the fifth day. The large soft uterus can easily fall into the hollow of the sacrum, causing a flexion. There is a sudden rise of temperature. Abdominal palpation fails to find the fundus, and on bimanual examination it will be found in the hollow of the sacrum. Lack of constitutional symptoms and scant lochia are observed, as in anteflexions. Intrauterine douches and correction of the position will give prompt relief. Both of these conditions are apt to occur about the time that the patient first begins to get up from bed.

Chart IX illustrates a case of toxæmia from retention, due to anteflexion. A moderate temperature failing to respond satisfactorily to intrauterine douches, on the tenth day the finger was passed into the uterus. This was found clean, but a sharp anteflexion was made out. The cervix was dilated and straightened, the temperature fell, and within forty-eight hours was normal. On the seventeenth day there was a sudden sharp rise, due probably to accumulation, but relieved at once by a douche. The temperature was then normal till the twenty-seventh day, when the patient was allowed to get out of bed. There was a slight rise of temperature each day when the patient was out of bed, till the thirty-sixth day, after which the temperature remained normal.

Chart X illustrates a case of puerperal toxæmia from retention due to retroflexion, not relieved by intrauterine douches, but cured by replacement of the uterus, temperature rising on the twelfth day, going higher with douches, but dropping at once to normal on the sixteenth day after replacement.

Temperatures from Excitement. Sudden mental shocks, such as grief or pain, are followed at times by a rise of temperature. The mental excitement passes, but the temperature persists. Examination shows the fundus somewhat enlarged or softened, the cervix well contracted, and a quantity of retained secretions in the uterus. The mental excitement seems to cause a relaxation of the uterus, without affecting the cervix. Hence there is a stenosis and retention of lochia. Treatment consists in dilating the cervix and emptying the

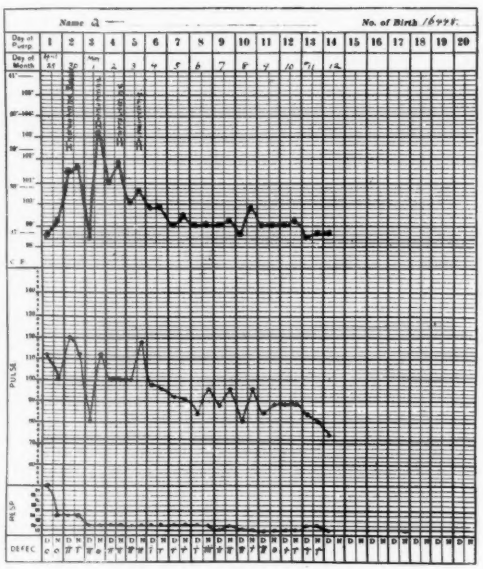


Chart VII. Puerperal toxæmia, from simple retention. Cured by intrauterine douches.

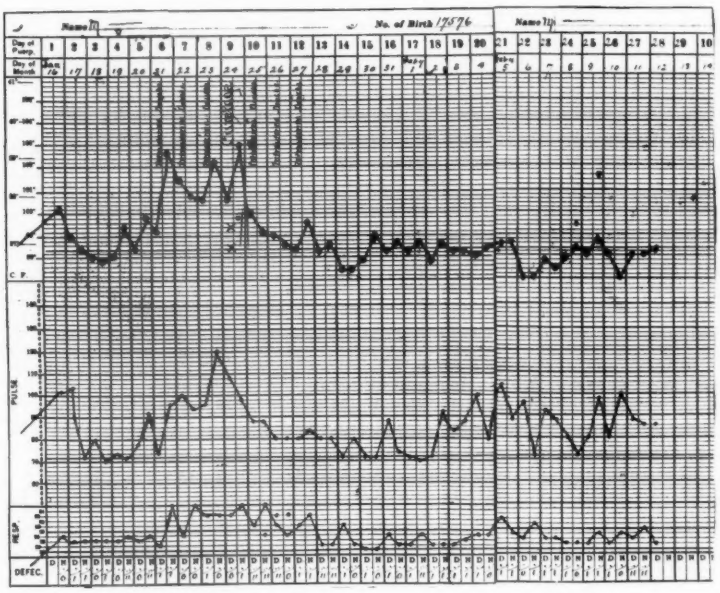


Chart VIII. Puerperal toxæmia, from retained secundines.

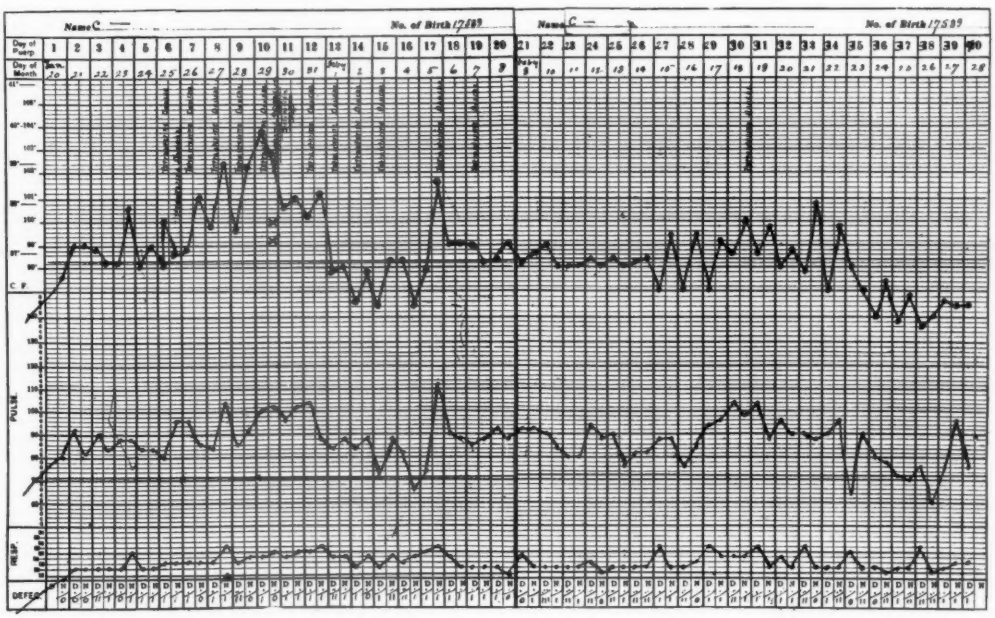


Chart IX. Puerperal toxæmia, from anteflexion. Cured by dilatation and correction of position. Condition aggravated by upright position.

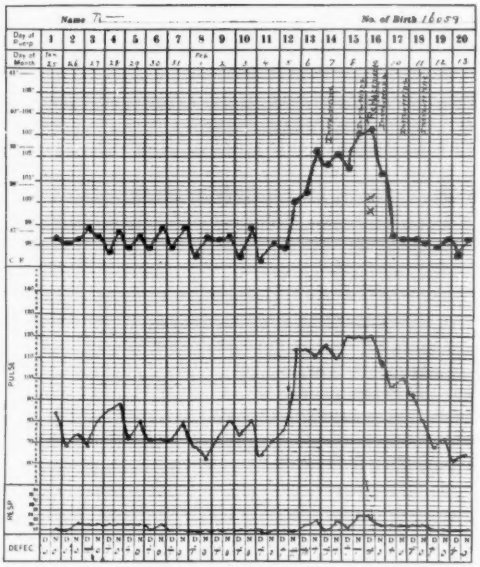


Chart X. Puerperal toxæmia, from retroflexion. Cured by correction of position.

uterus. An intrauterine douche will usually meet both requirements. Uterine tonics, such as strychnine or quinine, are also useful. This relaxation of the uterus is occasionally seen after a mastitis, with the attendant pain and excitement. The mastitis is cured, but the temperature persists. The obstetrician is worried, fearing the development of further trouble in the breast, or that he has made a wrong diagnosis, and that the original cause of the trouble was the uterus, and not the breast. Examination of the uterus shows the condition just mentioned, and an intrauterine douche washes out an accumulation of secretion, with a prompt dropping of the temperature to normal. These cases are puzzling, but I think that often the retention is secondary to the mastitis, with its pain and mental distress, and therefore the result of the mastitis.

Charts XI and XII illustrate these cases.

In Chart XI is seen the effect of a severe fit of crying on the temperature. On the fifteenth day, after a normal puerperium, the temperature suddenly shoots to 101° F., the patient crying all night over her baby. The next morning the mental distress had entirely disappeared, but the temperature continued to rise. Retention of lochia was found, and an intrauterine douche cured the condition at once.

Chart XII shows a mastitis on the eighteenth day. Treatment cured apparently the local condition, but the temperature persisted. Douches on the twentieth and twenty-first days washed out much retained secretions, with permanent relief of temperature.

6. Temperatures Due to Bacteriæmia. By "bacteriæmia," as mentioned above, I refer to that class of infection due, not to absorption of toxins from the uterus, but to the bacteria themselves, which have escaped from the uterus and are found in the tissues outside of the uterus, or in the general circulation.

Temperature from Septicæmia. At any time during the puerperium the temperature may rise; the earlier the rise, as a rule, the severer the infection. In the milder infections, the patients often do not seem ill at all. In the severe infections, they are rapidly prostrated. The infection here has passed through and beyond the uterus, and we find little local evidence of trouble. The uterus often seems perfectly normal. The lochia is normal. Intrauterine douches give no return. The finger passed into the uterus finds it empty. There may be an exudate on the cervix or vaginal wall, especially at the site of a recent tear, or

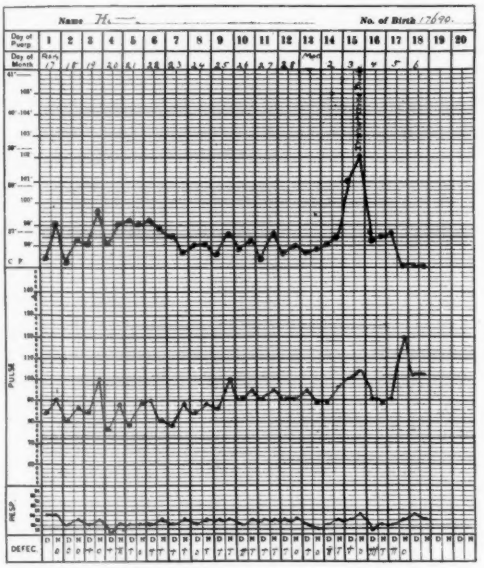


Chart XI. Puerperal toxæmia, from excitement. Cured by intrauterine douches.

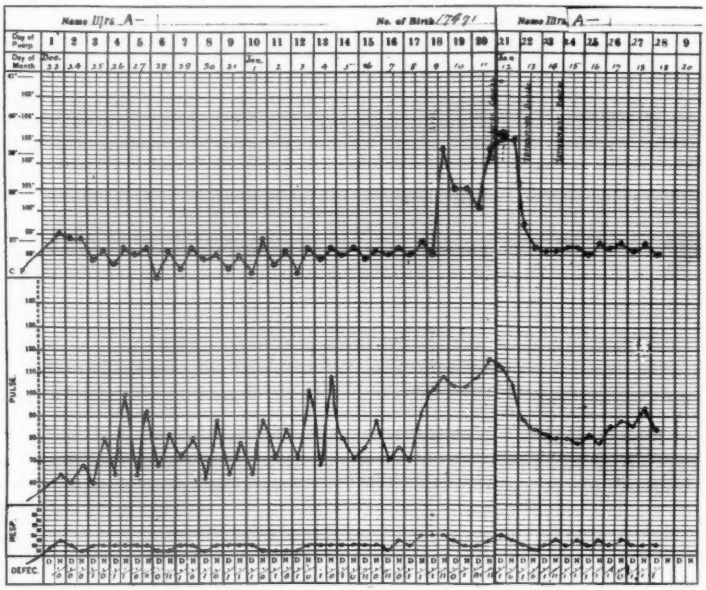


Chart XII. Puerperal toxæmia. Retention following mastitis. Cured by intrauterine douches.

even these local signs may be lacking. Local treatment is of little use. Intrauterine douches, when the uterus is empty, do harm, and should be discontinued. Hot vaginal douches, with ice-bag to the fundus, may be of use in improving the tone of the uterus. The chief reliance must be placed on general treatment, stimulation, nourishment, and rest. The prognosis depends entirely on the severity of the infection and the resistance of the patient.

Charts XIII and XIV represent temperatures of this type.

Chart XIII (let the superstitious take notice!) represents a rapidly fatal case, the rise of temperature appearing immediately after labor, rapidly becoming higher, and death on the sixth day, with a temperature of 107° F. (It is only fair to say that this case came to the hospital in labor, and already running a temperature.) Treatment was of no use.

Chart XIV shows a mild infection, beginning later, and running an irregular course. On the ninth day the uterus was found empty, and was therefore left alone, the temperature gradually dropping to normal, and the patient making a good recovery.

Temperature from Localized Injections outside of the Uterus — Salpingo-oöphoritis and Pelvic Cellulitis. The temperature rises at

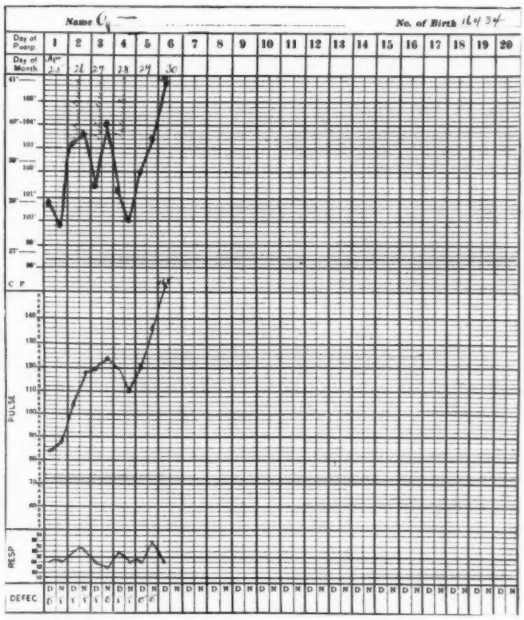


Chart XIII. Bacteriæmia. Septicæmia. Early appearance. Fatal termination.

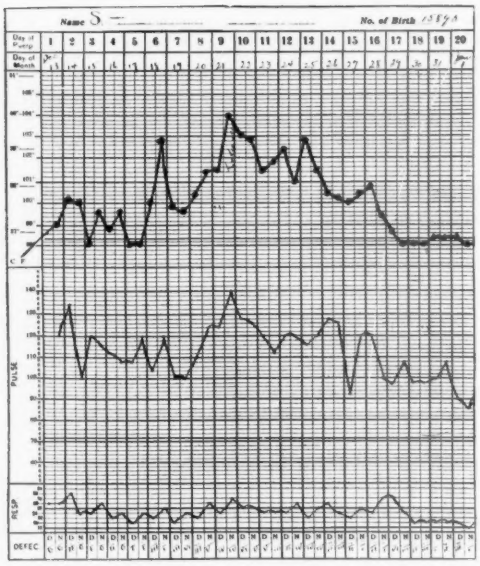


Chart XIV. Bacteriæmia. Septicæmia. Recovery. Uterus empty.

any time during the puerperium. Localized pain is complained of. Abdominal palpation discloses tenderness low down in the abdomen on one side, and bimanual examination shows a tender mass in one fornix. The condition may be a recent infection or an exacerbation of an old one.

Treatment will vary according to indications. Rest in bed, with hot vaginal douches, ice-bag to the abdomen, and judicious stimulation is usually the best treatment. If softening in the mass occurs, indicating pus formation, operation must be considered, either by laparotomy or vaginal drainage. Manipulation of the uterus is dangerous. An occasional intrauterine douche may be given to prevent accumulation of secretions, but frequent intrauterine douching is dangerous, and should be avoided.

Chart XV shows the temperature of a salpingitis cured by vaginal douches, rest, and ice-bags to the fundus. The temperature develops on the first day, and persists in spite of douches. On the seventh day the salpingitis is discovered, intrauterine douchings are discontinued, and the temperature gradually falls

Chart XV. Bacteriæmia. Salpingitis. Condition discovered on seventh day. Cured by ice and vaginal douches. Uterus practically empty.

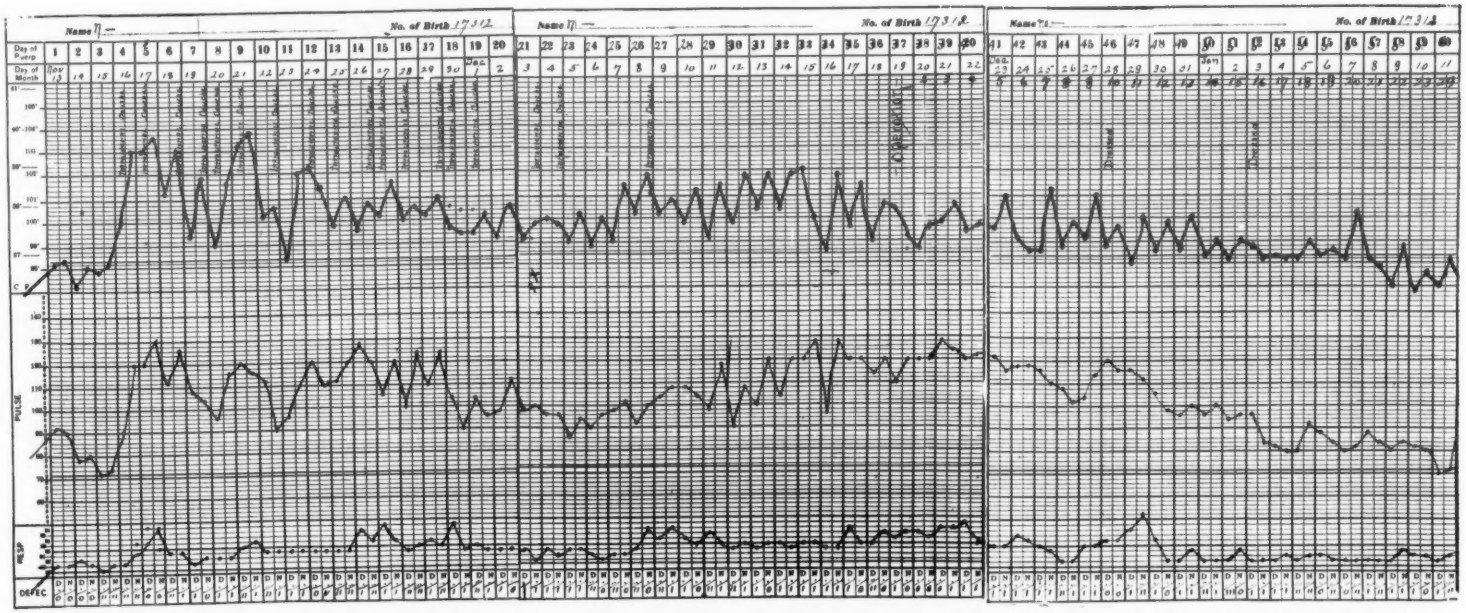


Chart XVI. Pelvic cellulitis. Verified by exploratory laparotomy. Uterus practically clean (empty) after twenty-eighth day, when diagnosis made. Bacteriæmia.

to normal. On discharge there was still a thickening of one tube.

Chart XVI is that of a pelvic cellulitis, temperature developing on the fourth day, and running an irregular course for over forty days. The mass was discovered on the twenty-first day, verified by exploratory laparotomy on the thirty-seventh day. On discharge, the sixty-sixth day, mass had almost disappeared. Treatment similar to that of previous case, intrauterine douches being discontinued when cellulitis developed.

Temperature Due to Phlegmasia, Alba Dolens, or Milk-leg. This occurs late, and is rarely seen at the Sloane Maternity Hospital, as the patients generally leave on the fourteenth day. A temperature occurring in the third week of the puerperium or later should always make us think of this cause. Pain over the course of the long or external saphenous vein will first direct our attention to the trouble. A tender lump over the vein with a swelling of the leg is diagnostic. Rest, elevation of the leg, with protection by a cotton covering or wet dressing, is the treatment. An ice-bag is often beneficial. The leg should not be put to the floor till all tenderness and swelling have gone.

Other causes, having no direct connection with the puerperium, may, of course, give rises of temperature. These all have their characteristic symptoms, and need no mention here.

Any rise of temperature during the puerperium will cause the obstetrician worry. No effort can be spared to find and remove the cause at once. Prompt treatment will save nearly every patient, and only in the severe and rapidly spreading infections do our efforts seem of no avail. Careful examination will generally reveal the cause of temperature.

Begin with the breasts and uterus. Palpate the breasts for distention, lumps, and localized tenderness, and start treatment at once if indicated. Palpate the uterus through the abdomen. Notice especially tenderness and height of fundus. Palpate over the tubes for tenderness. Examine the lochia. Inspect and smell the pads. Look at the vulva, the perineum, and the vaginal wall. Notice the cervix. Make a careful bimanual examination. Determine the position of the uterus and the condition of the appendages. Then wash out the uterine cavity with normal saline solution to make sure it is empty. Repeat this on the next day, if need be, and if these douches do not affect the temperature, palpate the uterine cavity with the finger, and curette if necessary. When the uterus is empty, intrauterine douches do no good, and should be stopped.

A careful physical examination of the throat, heart, lungs, and abdomen, with palpation of the veins of the legs, is necessary. Examination of the urine and blood is often important.

Fortunate it is that pain and tenderness will so often direct us to the seat of trouble; the kidney in pyelitis, the fundus in metritis, the appendages in salpingitis, and the veins in phlebitis. Only by examining the whole can we find the diseased part.

Lacerations of the soft parts, hemorrhage, and sepsis are the three dangers to which woman in labor is exposed. The most dangerous of these is sepsis. Asepsis cannot be too rigid. An accouchement should be treated as a surgical operation, on a table, with every aseptic precaution. Careful scrubbing of the hands, with antiseptic solutions, and rubber gloves will make the hands safe. One source of danger is often overlooked — the vulva and perineum. It is plainly foolish to make the hands sterile, only to rub them on an unclean vulva. Experiments show that it is almost impossible to insert even a small speculum into the vagina without carrying in germs from the vulva. The cleansing of the vulva is of the utmost importance. At the Sloane Maternity Hospital we have recently had this impressed upon us. In January we had an unusual number of septic temperatures. Every precaution against sepsis seemed to be observed. Finally, we decided that our cleansing of the vulva was not vigorous enough. Therefore, on the 1st of February this was made more thorough than ever before. The result was striking. During February, and to the present writing, in March, not a single temperature has occurred which can he traced to infection during labor. This seems to be more than a coincidence. Pay special attention, then, to the cleansing of the vulva, as well as to that of the hands. Careful asepsis, a uterus empty at the end of labor, and conscientious repair of recent lacerations (avenues of infection) will make sepsis rare. Hemorrhages can be stopped, lacerations may be sewn up, but sepsis must be prevented!

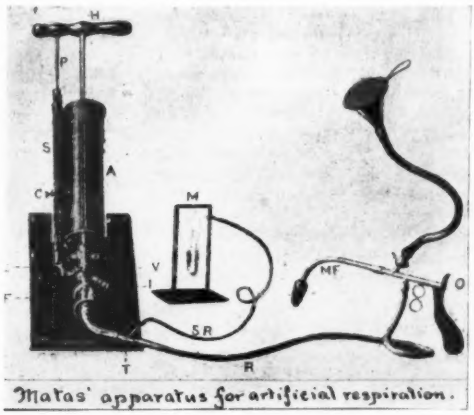
THE CONTROL OR ELIMINATION OF PNEUMOTHORAX IN PLEUROPULMONARY INTERVENTIONS

By DUDLEY TAIT, San Francisco, California

"STOP at the pleura" was the universal cry for more than seventeen centuries. From Hippocrates down to and after Billroth, it was taught and believed that surgery of the lung was not governed by the laws of general surgery.

The structure of the lung, its special functions, its relations with the heart, the presence of the pleural cavity, — all these facts, coupled with a long list of casualties on the battle-field, in the hospital, in the laboratory, served to perpetuate the religious observance of the semi-classic axiom, "Pneumothorax should always be feared, never created." And even to-day it is generally conceded that the sudden admission of air, either accidental or deliberate, during an operation on the chest, is often a source of grave peril to the patient and of profound anxiety to the operator. Thus, while surgery of the peritoneum elicited unbounded enthusiasm, and while the nervous, the osseous, the genito-urinary systems claimed their respective encyclopædias, the assets of pulmonary surgery were represented by a small number of intermittent, desultory communications. A composite film taken from the operating-room and physiological laboratory will suffice to explain the popular dread of the production of traumatic or surgical pneumothorax (Tuffier, Müller, Roux, Marey). Upon making a large opening in the pleura, the air rushes in noisily, the lung immediately collapses, the previously well-localized lesion escapes from view, the breathing at first stops, then becomes rapid, labored, then slower, irregular, and ineffective; the pulse is intermittent and then imperceptible; the operation has to be suspended; cyanosis is marked, and signs of collapse increase until death, which may occur instantaneously, as in chloroform narcosis, or within an hour or two from asphyxia. Closure of the wound will almost invariably attenuate the alarming symptoms and cause a rise of blood-pressure, but upon the admission of air the critical symptoms recur. Always more serious on the right side because of atmospheric pressure on the vena cava and the thin-walled right auricle, pneumothorax may vary in gravity according to the condition of the other lung or the heart, the patient's general condition, the presence or absence of pleural adhesions, the duration of the operation, and, finally, the more or less timely adoption of suit-

Fig. 1.



Matas' apparatus for artificial respiration.

Fig. 2.

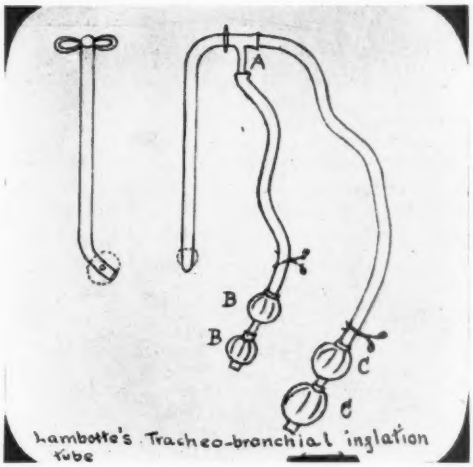


Fig. 3.

able measures for the control of pulmonary collapse.

The size of the pleural opening and the suddenness of the collapse of the lung are unquestionably the most important factors in determining the gravity and urgency of the symptoms. Thus, small pleural openings, such as are made accidentally in lumbar nephrectomy or deliberately in transpleural hepatotomy, seldom cause any disturbance. The same variable reaction displayed by different patients exists here as in pleural effusions, and no logical reason has been advanced in explanation of the occurrence, under identical circumstances, of the instantaneous death of one patient and only slight excitement in another. To attribute all to indiosyncrasy is to plead ignorance.

In the dog the picture is still darker, for, while, anatomically, the pleura of the dog do not habitually intercommunicate, practically they do so: the thin partition over the tendinous center of the diaphragm is pervious to air. Consequently, a unilateral opening in the pleura will give rise to collapse of both lungs and cause instantaneous death. Here, again, closure of the wound or fixation of the lung will check the symptoms of pneumothorax. The consideration of the radical treatment of certain extrapulmonary lesions throws much light on the subject under discussion, for, while the number of recorded pulmonary interventions is still small, there are numerous well-reported histories of intrapleural operations for tumors of the chest-wall or lesions of the pleura. A close analysis of the operative findings in a large percentage of these cases shows: 1. Frequent pleural adhesions; 2. Frequent co-existing pulmonary lesions, emphysema, sclerosis, calcification, œdema, hepatization, metastases. In these two classes of conditions, partly analogous to those calling for direct pulmonary interventions, the attenuated symptoms reported by the operators strongly suggest the occurrence of only *partial pneumothorax*. For this reason we cannot share in the opinion of those surgeons who have deduced from their pleural operations the harmlessness of intrathoracic interventions, and claimed that fear of the pleura would follow into oblivion the erstwhile fear of the peritoneum. However, most surgeons agree as to the possible dangers of pneumothorax in operations on the *non-adherent lung*. We may therefore conclude that the primordial problem facing the surgeon eager for rational pulmonary surgery is the elimination or control of acute collapse of the lung.

What is the mechanism of the recorded serious or disastrous phenomena following pneumothorax?

Diminution of the aërating surface of the lung by collapse can no longer be considered a factor.[1] Of the many theories advanced, two deserve serious consideration: 1. The displacement of the mediastinum, through pressure changes (J. B. Murphy, Garré, Bardenheuer); 2. Suppression of the centripetal impressions by immobilization and compression of the lung (Rodet and Pourrat).

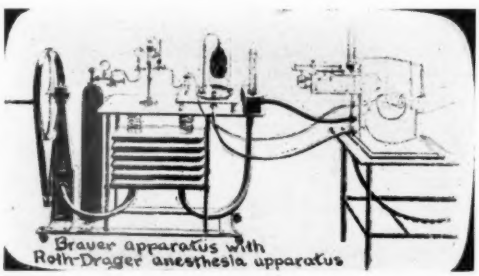


Fig. 4.

[1] Mayer's experiments in the dog show that hæmatosis is unaffected by the resection of three fourths of the total aërating surface of the lungs.

The methods of combating pneumothorax may be divided into: 1. Surgical; 2. Physiological.

SURGICAL METHODS

Lawson (1890) injected air into the pleural cavity in order to produce a slow pneumothorax instead of a rapid one. Likewise, Dollinger makes a "preparatory pneumothorax," under local anæsthesia, the day prior to the major operation. Rodet and Pourrat, in their experimental work, injected either oxygen or nitrogen, thus anticipating J. B. Murphy's work, which has recently received the enthusiastic indorsement of Mosheim and Brauer, in the treatment

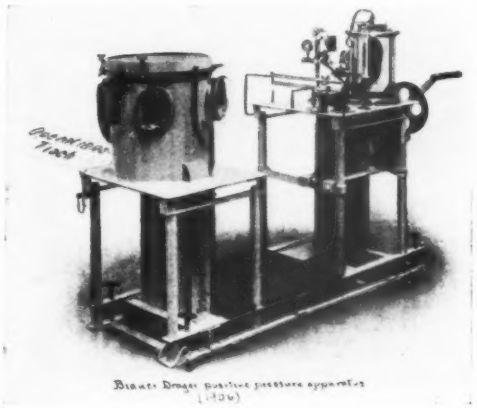


Fig. 5.

of pulmonary tuberculosis. Witzel injected water, substituting hydrothorax for pneumothorax. The use of caustics for the production of pleural adhesions is known as Quincke's method, although the same plan was used by Récamier fifty years earlier, in the treatment of hepatic abscess. Iodoform tampons on the exposed pleura (Krause), ignipuncture (Godlee), electrolysis (Quénu), suture with turpentine thread (Karewski) or juniper catgut (Korte), have been tested, with variable results, and are only of historical interest. Krause uses intrapleural compresses in very much the same manner as is customary in laparotomy. Müller (1888) was the first to note the importance of drawing up the lung, and Vautrin (1893) the first to suture it in the wound in order to attenuate pneumothorax. Quénu and Longuet advocated

Fig. 6.

a deep suture on the lung and chest-wall, including the adjacent rib (costopneumopexie). Roux's well-known continuous back-stitch is a valuable procedure in small, focalized lesions requiring incision and drainage. Delorme and d'Antona suggested incomplete anæsthesia and having the patient distend his lung by coughing. Closure of the pleura by means of compresses was first resorted to by Richerand (1826), and subsequently by Müller, Witzel,[2] and others.[3]

Delagénière's exploratory pleurotomy, which its author considers analogous to exploratory laparotomy, comprises several of the foregoing procedures. It is based upon the assumption

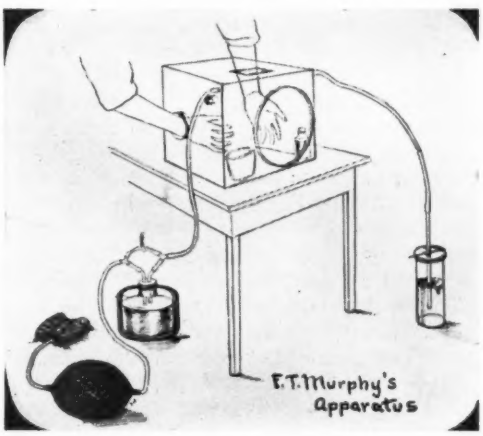


Fig. 7.

[2] Witzel fills the pleural cavity with salt or boric solution and then removes it by aspiration.

[3] Rixford recently referred to this maneuver.

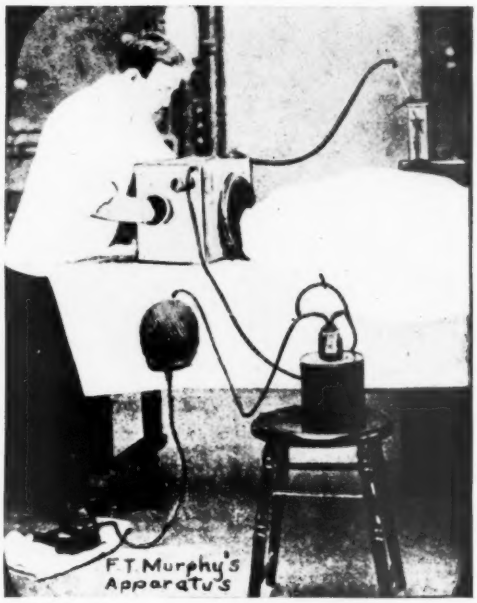


Fig. 8.

that the benign character of pneumothorax of pulmonary origin, or that produced experimentally by intrapleural injections of small quantities of air, is due to its gradual onset. The technique of Delagénière's procedure is as follows: U-shaped incision in the axillary line, and resection of the eighth, ninth, and tenth ribs. Make a small opening (1 to 1½ cm.) in the most dependent part of the pleura, allowing air to enter. If any respiratory disturbance supervene, close the wound with compress, or seize the lung with forceps and bring it into the wound. As soon as the breathing becomes normal, remove the compress or gradually release the lung until the pleural cavity becomes accustomed to the presence of air. The operator may thus witness the gradual development of "complete" collapse[4] of the lung. The pleural incision is then enlarged so as to permit either visual, digital, or manual exploration of the cavity and its contents. The pulmonary lesions having been located, the lung is sutured to the edges of the pleura, or to a second incision if the affected pulmonary area is situated higher than the exploratory incision. The air remaining in the hermetically sealed pleural cavity is then removed with an aspirator.

At the International Congress of Surgery (Brussels, 1905) Delagénière reported his eighth case treated according to the above-described method, and the recent thesis of his pupil Delacour contains several cases by other surgeons. It is but fair to state that adhesions were present in several of Delagénière's cases, only one of which can be accepted as illustrating scientific exploration of the lung and pleural cavity. In our own series of five deliberate pulmonary interventions, we have had occasion to use Delagénière's procedure only once — on an abscess of the non-adherent lung, which terminated successfully, notwithstanding the occurrence of grave shock which made immediate fixation of the lung imperative. In this case, owing either to imperfect anæsthesia or a too extensive pleural incision, the exploratory advantages of a liberal thoracotomy were not available. Delagénière's method is an eminently valuable emergency measure, and will undoubtedly prove very useful in localized lesions of the lower lobe of the lung. Here it may serve a double purpose by affording excellent drainage of the pleural cavity, which invariably becomes infected under such circumstances. The method in question is not, however, devoid of serious objections, a few of which deserve attention: 1. Dangerous symptoms may occur even in *gradual collapse* of the lung. 2. As a medium for dangerous infection, the pleural cavity resembles a vast Petri

[4] The term "complete" is used here in its clinical sense. Respiratory changes may take place in the lung several hours after its collapse. (Traube, Rosenthal, Hermann, and Keller.)

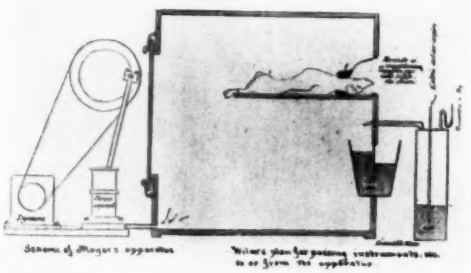


Fig. 9.

dish. 3. Even Delagénière admits the difficulties of visual or extensive exploration. 4. Fixation of the lung may subsequently interfere with its functions.

PHYSIOLOGICAL METHODS

Normally, the lungs, distended by atmospheric pressure (760 mm.) from within, are in a state of elastic tension. If, however, an opening be made in the pleura sufficient to admit air, the pressure or air within and without the lung immediately counterbalances and the elastic tissue at once recoils. Hence collapse of the lung.

In order to prevent collapse or retraction of the lung, all that is necessary is to establish between the interior and exterior of the lung a constant difference of pressure equal to the pulmonary retractility; i. e., about 10 mm. of mercury. This may be done by the use of either positive pressure within the lung or negative pressure without.

POSITIVE PRESSURE

Inflation of the lungs by means of a laryngeal tube originated with Vesalius. In the early part of last century it was extensively used in the treatment of asphyxia of the new-born (Depaul), and physiologists have long resorted to an apparatus for artificial respiration in animal experimentation (Legallois (1812), Magendie, Marey). Fell transformed the latter apparatus from the laboratory to the hospital, and O'Dwyer perfected the intubation-tube

Fig. 10.

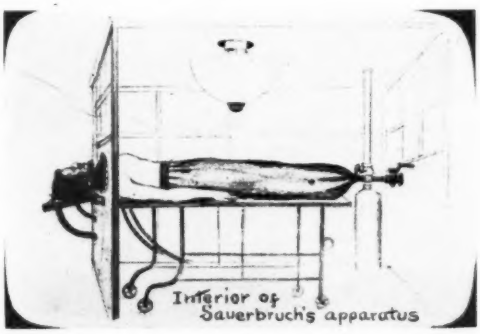


Fig. 11.

used by Bouchut 35 years earlier in numerous cases of diphtheritic laryngitis. The Fell-O'Dwyer apparatus has been used principally in emergencies occurring in intrathoracic operations, but it is valueless for the maintenance of normal respiration during the time required for exploration of the pleural cavity or lung. The grave dangers attending the use of the Fell-O'Dwyer apparatus are due to the total absence of any means of measuring intrabronchial pressure. Furthermore, the alternating distention and retraction of the lung caused by the Fell-O'Dwyer apparatus render all operative measures laborious, and necessarily incomplete. (Figs. 1–3.)

E. Lambotte[5] of Brussels, was undoubtedly the first (1894) to advocate the use of pulmonary inflation in intrathoracic interventions. In the operation of decortication of the lung on the cadaver and in the anæsthetized dog, Lambotte inflated the lung by means of a tracheobronchial tube,[6] and obtained some very interesting results.[7]

The first scientific study of pulmonary inflation for the prevention of pneumothorax during pleural operations was made in 1896 by Tuffier and Hallion, who proved that a pressure of 6 mm. of mercury sufficed to overcome the elasticity of the lungs and equalize the air-pressure, and that a pressure of 33 mm. would be required to stop and defeat the purpose of the insufflation. Using an intubation-tube,

[5] Lambotte is well known as the inventor of the urinary segregator, which he used as early as 1891.

[6] Loison (October, 1906) suggested an almost identical instrument to be used in conjunction with Killian's bronchoscope.

[7] Large quantities of liquids could be injected into the inflated lung without causing asphyxia or circulatory disturbances.

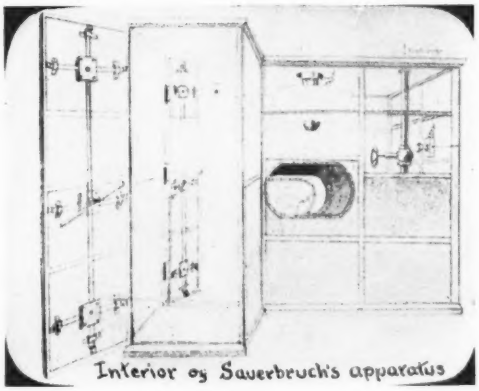


Fig. 12.

they demonstrated the possibility of regulating at will the dimensions of the lung, by varying the intrabronchial tension.

Quénu and Longuet (1896) were the first to study the problem of spontaneous respiration under a constant pressure. (Figs. 4–8.) They sought to overcome pulmonary elasticity by inclosing the animal's head in an apparatus resembling a diver's suit and containing compressed air. With this crude apparatus, the lung was easily made to remain in contact with the chest-wall after opening the pleura. Quénu and Longuet failed to apply their findings to the human subject, but the principles of both negative and positive pressure so carefully outlined by them form the basis of all subsequent scientific work for the prevention of pneumothorax. Eight years later, Brauer and Peterson proposed their "mask," in which a plus pressure of 10 mm. of mercury is used. Upon opening the pleura, on one or both sides, in dogs, no perceptible change in the blood-pressure or pulse was noticed in any of the operations performed with the aid of this apparatus. Tuffier, who has employed Brauer's apparatus in three interventions, refers enthusiastically to the ease and safety of intrapleural operations under positive pressure. In F. S. Murphy's apparatus we find the same principles illustrated, but in a simple and inexpensive manner. Murphy has used his apparatus extensively in animals (31 operations), and in one surgical case (a man with abscess of the non-adherent lung). In this case the lung did not collapse when the thorax was opened, and the entire operation — exploration, incision, and drainage — was done with ease, although marked cynosis was noted during and several hours after the operation. According to Murphy, to avoid trouble with the heart, the pressure should be run just as low as possible to give sufficient oxygen: about 5 to 6 mm. instead of 10 to 12 mm. of mercury.

While all physiologists admit the great value of pulmonary inflation in experimentation, clinical experience has shown that it cannot fulfill expectations in surgery.[8]

The following are objections to inflation:

1. It reverses the normal respiratory rhythm.
2. Sudden distention of the lung has caused interstitia lemphysema, subpleural hemorrhages, etc.
3. Impeded pulmonary circulation causes dilatation of the right heart.
4. The body temperature is markedly lowered by excessive evaporation, thus increasing susceptibility to infection.

Hallion's experiments (1896) with accurate pressure-gauge apparatus partly nullify some of the preceding arguments. Hallion showed that only negligible changes were induced by artificial respiration, provided it be used within physiological limits. The fall in blood-pressure due to venous stasis occurs only upon forced or prolonged inflation.

NEGATIVE PRESSURE

The essential feature of Sauerbruch's method is to maintain a negative pressure over the exposed lung equal to the pulmonary retrac-

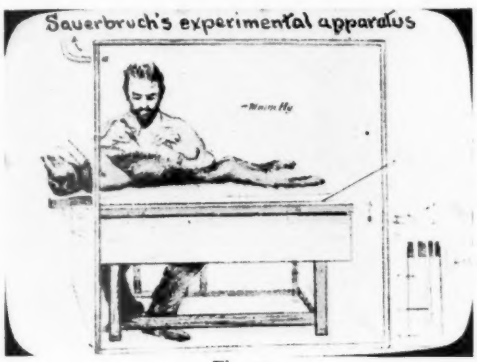


Fig. 13.

[8] The surgeons of this country were the last to abandon inflation.

tility; i. e., about 10 mm. of mercury. Sauerbruch's apparatus consists of a hermetically sealed room with 14 cubic meters of air space, arranged for operations under the negative as well as the positive pressure. The narcotizer is seated on the outside, but is able to hear the instructions called out by the operator. The patient's body lies in the cabinet, the head outside, and the neck is surrounded by an air-tight cuff. A rubber sack, covered with canvas, surrounds the lower half of the patient's body, and connects with the outside by means of a straight tube. The entire body of the patient, with the exception of the thorax and upper extremities, remains under ordinary atmospheric pressure. The normal pressure conditions between the veins and the right atrium are thus maintained, and stasis of the blood will not result.[9] (Figs. 9–15.)

Sauerbruch generally begins with a minus pressure of 8 mm., varying then from 4 to 6 mm. Before closing the pleura, the minus pressure is increased to about 12 mm., completely obliterating the pleural space. By increasing or diminishing the pressure, the lung may be made to recede or expand, thus permitting exploration of the entire pleural cavity. The opening of the pleura under the conditions prevailing in the cabinet is unattended with any shock or change in the pulse or respiration. After hermetically suturing the wound, fresh air is allowed to enter the cabinet. The spectators experience no discomfort within the cabinet or upon leaving it.[10]

Sauerbruch's apparatus has been used in 17 cases at Breslau by Mikulicz, Sauerbruch, and Garré:

Operation		Cases	Deaths
Lung	Gangrene	4	2
	Abscess	3	1
	Bronchial fistula	1	.....
Chest-wall	Extension of breast carcinoma	2	.....
	Osteosarcoma	1	1
Heart — One suture		.....	1
Œsophagus — Inoperable carcinoma		5	5
		17	10

Mortality, 64 per cent.

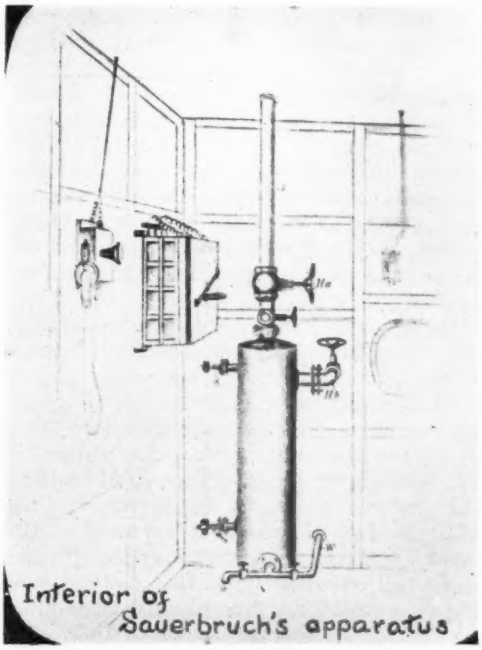


Fig. 14.

[9] Sauerbruch found stasis harmless, and recently discarded this part of his apparatus.

CHOICE BETWEEN POSITIVE AND NEGATIVE PRESSURE

Those who have studied both negative and positive pressure assert that the physiological objections to the one are applicable to the other. In both, the pulmonary capillaries are subjected to more than normal pressure, but, clinically, this may be ignored. The most serious objection to positive pressure relates to the marked hyperpressure on the large vessels at the basis of the heart, although this objection is partly negatived by Brauer's failure to note any disturbances in numerous medical patients treated in his apparatus, and also by Tuffier's three successful intrathoracic interventions with the same apparatus. On the other hand, it is generally conceded that the problems of pressure are more easily and more accurately solved with Sauerbruch's apparatus than with any of those in which positive pressure is used. The latter, however, are more easily handled, and vastly less expensive. The weight of Sauerbruch's apparatus is about ten thousand pounds, and its cost approximates three

[10] —10 mm. pressure corresponds to an altitude of 300 meters; i. e., 985 feet. Some circulatory disturbances have been experienced in the small experimental model of Sauerbruch's apparatus (Mayer).

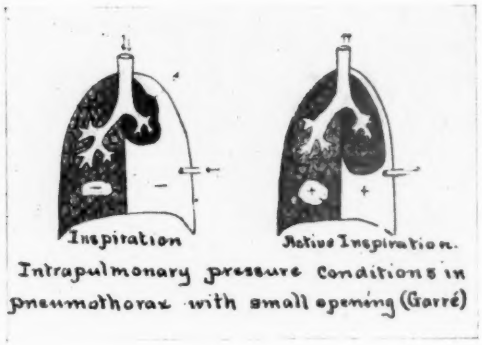


Fig. 15.

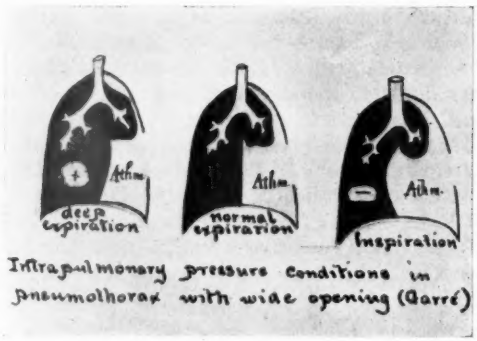


Fig. 16.

thousand dollars. A practical positive-pressure outfit, we believe, may be obtained by adapting a suitable pump to a small, well-built room.

ARE PHYSIOLOGICAL METHODS NECESSARY?

The answer must be in the affirmative for operations involving both pleura (tumors of the sternum and certain mediastinal conditions). On the contrary, surgical methods have generally proven adequate in the treatment of infective lesions of the lung. In the opinion of many surgeons, the newer methods are not indispensable in pleuropulmonary surgery. These operators seem to view the question solely from the operative standpoint. While our personal list of operations[11] on the lung comprises but one instance in which surgical methods were manifestly insufficient, we cannot refrain from calling attention to the conceded doubt surrounding the early diagnosis of pulmonary lesions and to the high mortality in wounds of the lung (Garré found 54 per cent in 700 cases). Until the advent of the newer methods, the status of exploration of the pleural cavity recalled the condition of pelvic surgery in the days of Spencer Wells, out of which obscurity Trendelenburg's posture caused us to emerge. We do not seek to belittle the value of surgical methods, but we are deeply impressed with the need of some safe method of *exploration*, by means of which the various pulmonary lesions can be diagnosed early and accurately. Under such conditions, a *well-regulated operation* would be possible, and the most dangerous element in surgical methods —infection— might be perceptibly reduced. Whether or not physiological methods will place intrathoracic explorations on the same footing as exploratory laparotomy must be decided by experience and not on theroretical considerations.[12] (Figs. 15-16.)

[11] Three abscesses; one bronchiectasis; one gangrene.

CONCLUSION

Surgery of the lung is only partly governed by the laws of general surgery; and although the pleura resembles the peritoneum in its marked susceptibility to infection, the advent of asepsis has not perceptibly enlarged the field of thoracic surgery.

Acute pneumothorax is less dangerous and more amenable to surgical measures than is commonly believed, but in its control we may find the key to the much-needed *scientific exploration* and safe treatment of numerous intrathoracic lesions.

Delagénière's method is unquestionably the most valuable of the surgical methods for controlling pneumothorax.

The Fell-O'Dwyer apparatus may answer in an emergency, but the uncontrolled pressure thereby exerted on the entire mediastinum may prove very injurious to even a normal heart.

Experience alone will tell the value of the addition of physiological methods to the technique of intrathoracic surgery and decide the choice between the simple, the positive, and the complicated negative pressure apparatus.

[12] In the remarkable report presented to the recent French Congress of Surgery (October, 1906), Willems concludes that while the newer methods are not indispensable, they have already demonstrated the necessity of avoiding the greatest danger in intrapleural operations; i. e., infection. The use of negative pressure is formally contraindicated in wounds of the diaphragm and in all varieties of thoraco-laparotomy (Willems).

OPERATIONS ON THE JAW-BONE AND FACE

A Study of the Ætiology and Pathological Anatomy of Developmental Malrelations of the Maxilla and Mandible to Each Other and to the Facial Outline, and of their Operative Treatment when beyond the Scope of the Orthodontist

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FIRST impressions are the strongest, and often the most lasting. In no instance is this truer than in our social relations and in the impress we make upon our food on its first entrance into our sphere of being. The contour of the face and the physiological condition of the masticatory apparatus are strong factors for good or evil in both instances.

While surgeons for centuries have expended every talent and energy upon the correction of deformities of almost all kinds, from club-foot to malrelation of the teeth, both for cosmetic and utilitarian reasons, yet little study or work seems to have been done to alleviate those distressing conditions that arise from excessive asymmetry of the dental arches. Where this deformity was too great to be corrected by orthodontic appliances, the victims have, so far as I can determine, with the exception of a few isolated cases, been compelled to go through life without relief. I refer to cases where the mandible and the maxilla are not of corresponding size or shape, or where the alveoli bear abnormal relations to each other.

In this paper I will deal specially with those deformities in which, after the bones have matured, any of the above conditions exist, causing deformity or aberration of function that cannot be corrected by the mere changing of the relative position of the teeth or bending of the bone, and which materially interfere with the comfort, happiness, or usefulness of the patient.

The conclusions are drawn from general surgical and dental literature, the discussions at medical and dental societies which I have had the privilege of addressing on the subject, quiet talks with orthodontists and surgeons, some thought, the observation of faces and mouths, the study of plaster reproductions of dentures which my orthodontic friends have placed at my disposal, special dissections, and operations on dogs, cadavers, and patients.

I will beg my dental friends that in criticising my presentation of this subject, they remember that I am dealing primarily with the jaw-bones and the face, and with the teeth only incidentally; that my training is that of a general surgeon; and that what knowledge I possess of teeth, occlusion, and orthodonture, I have borrowed from them.

Though this paper is devoted to the subject of non-traumatic deformities, cases of traumatic origin which have been augmented by resultant disease or misapplied force, or both, come well within its scope.

The original factor in the production of these conditions, whether disease, trauma, or atavism, is in many of the cases directly responsible for but a small amount of the deformity, and for all of it in none. Once destroy that nice balance upon which the natural development depends, and the normal muscular forces will operate to exaggerate the malrelation. In the cases I have observed, the malrelation consisted either in a disproportionate growth in the length of the body of the lower jaw, in a lack of development of the upper jaw, in a lack of development of the lower jaw, in a bending downward of the lower jaw at or in front of the angle, or possibly a forward displacement of the upper jaw, or in a combination of these conditions.

For convenience of description I have arbitrarily divided the resultant deformities into five classes, which I will enumerate here, but will describe later. In cases of the first class, the body of an otherwise normal lower jaw protrudes forward; in those of the second, the body of the lower jaw is relatively retracted; in those of the third, the anterior part of the lower jaw protrudes on account of an abnormal lengthening in the bicuspid region; in those of the fourth, the upper or lower jaw is deficient

Fig. 1. On the left is the classic Greek type, and on the right its Russian and Roman derivatives. In the Russian faces, while the Greek brow and nose are retained, there is greater breadth and weight in the lower part.

on account of the lack of certain teeth in either; and in those of the fifth class, while the second molars are in occlusion, the anterior teeth fail to occlude by increasing distances, due to a bending downward in the body of the bone.

A sixth class, but an atypical one, might be added, which would include deformities resulting from abnormal extraneous forces, such as the contraction of scars, spasm, or paralysis of muscles other than those of mastication.

The proper correction of these deformities is prevention. The incoming teeth should be watched, and the slightest tendency towards irregularity should be referred to the orthodontist. Contracting scars should receive proper attention. Irregularities already established should receive the same consideration, and up to the age of puberty, and even beyond that period, the bone of the lower jaw will admit of considerable molding by means of appliances.

There are, however, a number of cases that have been allowed to grow to maturity, which exhibit the full effects of the misapplied force. These are the cases in which the surgeon can come to the aid of the orthodontist. If called upon, our endeavor should be to set the bones in the position that will ultimately give a useful occlusion and the most symmetrical facial outline. Occlusion must be an end, not a guide, while good mechanical and not ideal occlusion should be the object. In none of these cases will it be possible to establish immediately the best occlusion, and approximately ideal occlusion would rarely be accompanied with the best facial result. On the other hand, the establishment of the best facial outline will never preclude a good useful occlusion. Granting that our skill and the conditions in a particular case are such that we could shift the chin and jaw to any desired position, it still remains for us to exercise considerable judgment to determine, in this particular case, which position will give the most effective facial outline. Ideal occlusion would certainly be a simple guide. It is definite and easily defined, while facial contour is quite the opposite. Most of us who study faces can say what makes or mars them. We also have ideas as to what pleases us, but this is often a matter of taste, and all conclusions are modified by the temperament of the individual observer.

Occlusion conserves unvarying mechanical principles; while facial contour adapts itself to and portrays the intelligence, the actions, the passions, and the sufferings of the individual and the race. In so far, only, as are similar peoples subject to similar influences do we find them with faces having common characteristics. This has led to the establishment of types, which, in themselves, are distinct, and in each of which, when pure, there may be strength or beauty, or both. It is mostly to the expressed predominance of low passion or the atavism of incongruous mixing that the ugly or displeasing countenance is due. With the expression of individual intelligence or passion we have no dealing in this work, but defects or malrelations in the hard structures of the face must be the

Fig. 2. A study of a mixed type. *A*. A face of a very high type. *B*. Prognathic faces of a lower race. *C*. An harmonious mixture of the prognathism of the lower race and the straight features of the higher race.

subjects of our deepest study. To me, some of these seem to be due to pure atavism. To appreciate their possible origin we must go back to the time when the world moved slowly and nations did not mix; then we can read in the individual the character of the race as plainly as we can read in the inanimate the habits and customs of the animate it served: from hence can be traced many types and the influences that created and modified them. To do this, however, would take us far beyond my purpose and encroach on your time; but I will illustrate with an example.

In authentic records of classic types we will pass over the Assyrian and like nimrods, whose whole expression was in the eye, also the Egyptian, with his shrouded brow and smile of mystery, that for centuries ruled that world, to the Greek, who studied the human form and beauty until he created gods. Here we have a high forehead continuous with a long, straight nose, a short upper lip, somewhat retreating and full curved chin, short cranial index, with chin, lower lip, and root of nose all on a line — the most beautiful type recorded. We trace it down to Rome, and see it change with succeeding influences, gradually taking on greater weight in the lower part of the face with the increase of license, while stability and judgment expand the occipital region, which with the lowering of the forehead brings symmetry of another kind. The broad mouth of the orator is balanced by an increased breadth of the brow; the long upper lip and increased subnasal angle is rendered inconspicuous by the aquiline nose. Following this same Greek in another direction, traveling up the Black Sea to the country of the Slavs, we find that a different set of influences has produced another type. Here we have illustrated several higher types, all with impressive brows; while the characteristic feature of lower types is the prominence of the lower half of the face. The individuals of modern civilized races are mostly the product of many mixtures. It is the mixing with peoples of lower mental and higher muscular development that adds longevity to these races. This mixing in a certain precentage of cases must produce prognathism, while in others the orthognathism will be perserved. If, through some freak, nature fixes an extremely prognathic lower jaw on an orthognathic upper, or *vice versa*, we have deformity. If she add prognathism to a Roman brow and nose, we have a physiognomic absurdity, as illustrated in the profile of Dante; but it can be incorporated with the Greek face or with many of the Greek derivatives without detracting from them in the least, as illustrated by this ideal head, and we see around us many instances where it is pretty and often beautiful.

I lay particular stress upon this latter type, for, as it is both mixed and modern, it has more bearing upon our subject than all of those previously mentioned, and its possible attractiveness, even when extreme, gives us great latitude in our manipulation of the lower jaw.

Maxillary prognathism without corresponding projection of the lower jaw is extremely common. The types just quoted are my authority for maintaining that when it is sufficiently pronounced to be a deformity, to correct it we

Fig. 3. Prognathic natural and ideal faces, which furnish artistic precedent for departing from the classic ideal by bringing forward a relatively retracted lower jaw.

are not called upon to attempt to raise the profile to a position in the scale to which evolution has not carried it, which would be a surgical impossibility, but may bring forward the lower jaw to a harmonious outline, thus placing it within the limits of an accepted type, which is a possible procedure.

It is my belief that from an artistic standpoint most cases of maxillary prognathism would be improved by this procedure. The reverse is not true, for in making the mandible conform to a retreating maxilla, we may destroy the one strong feature in a dish-face.

Artists have formulated laws of correct facial outline that will further guide us in this work. 1. The septolabial angle should be ninety degrees. An exception to this is the case of the overhanging Roman nose, where it may be greater. 2. The lower lip should not protrude beyond the upper. 3. The distances between the hair line and the root of the nose, between the root of the nose and the subnasal angle, and between the latter and the tip of the chin should be about equal. None of these rules are, however, absolute.

Fig. 4. Profile of Dante.

In operating, the surgeon must not attempt surgical impossibilities nor be misled by false issues. Occlusion, normal or abnormal, is the result of pressure and counter-pressure, of growth and apposition, and can never be established simply by bone cuts. The real issues ordinarily at stake are facial outline, which includes both the profile and the lateral breadth, and the ultimate occlusion, while immediate occlusion is a secondary consideration. To do his work correctly, it is absolutely necessary that the surgeon shall have at least a theoretical knowledge of the scope and limitations of orthodontic operations and a perfect knowledge of occlusion.

In the operation to be described we have to deal with an upper solid jaw and a lower one that is a hoop of bone capable of almost any kind of adjustment; and it is upon the latter that our efforts must be expended. It must have occurred to almost every thinking observer that it would be easy to correct the open bites and underhung jaws if one could but cut through the bone that carried the nerve and blood supply to the teeth. The ultimate result of such a cut has been the cause of much contention among orthodontists for years, and a fear of necrosis or non-union of the fragments has held them in check — I think I can show without reason. Ununited fracture of the lower jaw is rare, and in the whole of the Surgeon-General's Index there is not reported a single case, in English, German, or French literature, of necrosis or loss of teeth from sections of the vertical or horizontal ramus, yet this is a

recognized procedure for ankylosis. Esmarch recommends the removal of a section from the horizontal ramus for this trouble, because of the liability of the bones reuniting after simple section, and this is the method advised in the standard text-books of to-day. Finally, besides the operations I have done, such a section of the mandible has been done lately by a surgeon in England, and one was operated upon in this country. In only the latter case has necrosis followed, and that was at the site of the cut, due, I believe, to local infection. I do not think we need to concern ourselves with the consequences of cutting the inferior dental nerve and artery.

In dealing with the ætiology of these cases we will start by simply accepting acquired and congenital irregularities of the teeth, without considering the causes that produced them, but will endeavor to show how these irregularities are at times themselves responsible for certain malrelations of the jaw-bones.

Before proceeding to the detailed consideration of the ætiology, pathology, and correction of each of the different classes of cases, it will be well for us to review certain gross developmental facts.

The normal adult relation of the dental arches is not obtained until the bones are full grown and the jaws are separated by a complete quota of teeth. An exception may possibly be made of the third molars. The development of the face as a whole has an essential bearing on this relationship, for as the maxilla grows downward it changes the plane of the hard palate from above the temporomaxillary joint, as found in infancy, to a considerably lower level, best shown in an edentulous skull of age. The body of the mandible travels with it, and the ramus is formed to compensate for the change in position. Until the ramus appears, there can be no real angle. Non-traumatic malrelations of the dental arches, or a portion of them, are, as a rule, early determined, and if not controlled, increase with growth. As before mentioned, the teeth properly opposed to each other in normal succession with concurrent growth of the bones are the factors that establish the normal jaw, and it is to faulty succession or position of the teeth and irregularities of bony development that most of these deformities of the bone are due. Atavism, trauma, and disease are the determining factors.

The positions of the upper and lower first permanent molars will indicate the relations of the jaws to each other. This should be such that the lower first molar inclining inwards has only its outer two thirds in contact with the upper and its lingual edge and mesial cusp

Fig. 5. A very good natural occlusion, closely approaching the "ideal normal occlusion" of Angle. Note that there are two occlusial planes of the grinding surfaces, which meet at the mesobuccal cusp of the second upper molar; the posterior, directed downward and forward, must be considered in correcting cases of class 2.

Fig. 6. Natural skull, illustrating the deformity and the correction in cases of class 2. Note that the deformity is due mostly to a shortening in the ramus, which is usually the case. In this skull, however, all of the vertical diameters, the height of the forehead, the height of the orbit, and the height of the ramus are short in comparison with the transverse diameters, and the maxilla is prognathic. Yet, when considered alone, the prominence of the nasal bones and the shape of the cranium would place the skull very high in the scale of development. This I take to be a plain instance of atavism, and the malocclusion an accident dependent upon this atavism.

hanging free.[1] Any change in this relation will cause a crowding one way or the other, and the teeth belonging to the crowded space must take abnormal positions, and, unless corrected, permanent deformity results. When once established, this deformity tends to increase.

As in certain cases an abnormal angle is either a contributing cause or a result, a careful study of this angle and the factors which control it is opportune. During the period of complete permanent dentition the angle of the jaw is, as a rule, about one hundred degrees. In youth and extreme old age this angle is greater. From youth to adolescence these changes are accomplished by a deposition of bone, in old age by a process of absorption, though in childhood the bone may be bent in any part. At birth, the body of the mandible is straight, and rests squarely against the maxilla. From the cutting of the first incisors till the third molars are in occlusion, there is a space, distal to the occluding teeth, which is an unsupported arch, upon which most of the power of the internal pterygoid and masseter muscles is expended. The body of the lower jaw is not normally called upon unaided to resist the action of the masticatory muscles, nor is it capable of doing so. These, drawing on the angle, tend to cause a yielding upwards in the body of the bone in this space. The bending at this point allows the jaw to push forward if unresisted. If, during this period, the inferior incisors are not firmly locked behind the superior, we have the beginning of forward protrusion, which, if unresisted artificially, will result in the undershot jaw, which comes under our class 1. Lack of development and lack of forward progression of the maxilla may bear the original responsibility of the condition. To correct this deformity a lower tooth on each side is drawn, probably the second bicuspid, and after the cavity in the alveolus is healed, we proceed as for correcting cases in class 3.

Fig. 7. Dissection of jaw of young child, showing space between the last occluding molars and the ramus of the jaw. This space is a factor in the production of the deformity in cases of classes 1 and 5.

[1] Angle. Malocclusion and Fractures of the Maxilla.

The growth of the mandible is accomplished by the deposit of bone on the outer surface of the body and at the epiphysis of the condyle, and also upon the posterier border and tip of the coronoid process and on the posterior border of the ramus, with an accompanying absorption of their anterior borders, which brings about a backward march of the ramus. If the lower jaw fails to develop in proportion to the upper, we have it as a whole in distal occlusion. This lack of development, when extreme, produces the cases of our class 2.

In cases of class 2 we have a condition where the inferior dental arch, as a whole, bears an abnormal relation to the upper, and it is reasonable, in correcting it, to move it as a whole. This can be done best by making a cut through the vertical ramus. After the cut is made, the jaw is moved forward to the position desired. Occlusion and facial outline are both to be considered, and the jaw is to be steadied in place by inserting soft cement between the grinding surface of the teeth and by fastening the lower to the upper with wires, but artificial fixation need not be made at the site of cut. As to the location and direction of this cut, I have done considerable investigating, but space will not allow me to do more than state my conclusions. This operation can be done above the entrance of the inferior dental nerve and vessels into the canal, thus avoiding their section, but here one may be crowded for space, and run the risk of injuring the parotid gland, large vessels, or the facial nerves. This section may be made in the line of the grinding surface of the inferior molars, or preferably one fourth above, with little risk of injuring any important structures except the inferior dental

Fig. 8. An extreme case, with backward and lateral displacement of the jaw, following very early injury. On account of the angle of the jaw striking an abnormally developed styloid process, the patient could open the mouth but one eighth of an inch. The final result in this case is that the chin is forward three eighths of an inch, and is in the middle line, the mouth opens freely seven eighths of an inch, and the two *cases* are almost invisible.

nerve and artery. In cutting the nerve just where it enters the canal, which is about this point, it has the best opportunity of reuniting.

The operation is done in this manner: An incision one half or five eighths of an inch long is made through the skin over the posterior border of the mandible. Now the skin and the cut are drawn forward and the parotid sheath is opened and the gland drawn backward until the posterior border of the ramus can be felt with the tip of the little finger. A large, strong, curved needle on a handle is now passed behind the ramus, hugging the bone closely. It passes forwards and emerges through the cheek without the mouth being opened. It is followed by a Giggly wire-saw, and the bone is cut through, which takes about forty seconds for each side.

Hemorrhage is controlled by packing the space with sterile or mildly antiseptic tape, which is left in place for two days. In this operation the parotid is pushed out of the way, as is also the cervicofacial division of the facial nerve, which lies at the posterior border of the jaw. The temporomaxillary vein is also avoided, and the external carotid lies well out of the way. These anatomical points were verified by thirty special dissections.

The needle used is full-curved, and the point is so formed that it will dissect the soft structures from the inner surface of the bone rather than penetrate them. In this way bleeding is avoided, and there will ordinarily be no danger of penetrating the mouth. To prevent damage of the skin, after the saw is in place a short, small steel tube is passed over the anterior end of the saw, through the skin and down to the bone. Posteriorly, the parotid gland is held well back with a small retractor. In cutting the bone the saw is held as straight as possible, and the operator should be familiar with the tricks of a Giggly saw.

This operation presents three distinct problems: 1. The cutting of the bone, which is the easiest of the three; 2. The placing of the jaw in its new position; and 3. Holding it there.

On account of the obliquity, already referred to, of the posterior part of the occlusial plane, the body of the lower jaw can be brought forward only by lengthening the ramus; therefore the line of the saw-cut should be slightly downward and forward — about a quarter of an inch lower in front than behind. This will allow the body to be moved downward as well as forward without completely separating the severed fragments. It is only the posterior part of the body that moves downward, and the rotation thus produced lessens the obliquity of the plane of the chin, which is a very distinct advantage. In order to lengthen the ramus, it is necessary to stretch the masseter and internal pterygoid. This is best accomplished by inserting a fulcrum, such as a piece of pine, between the molars on each side and forcing

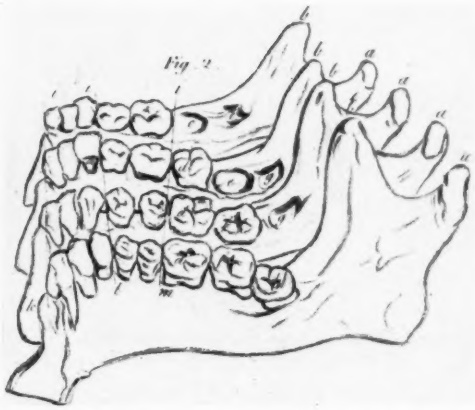

Fig. 9. Illustration of the normal growth of the jaw by John Hunter. Note that there is no increase in length in the bicuspid region. It is a variation from the normal, by growth at the site of these teeth, that produces the deformity in cases of the three classes.

the chin upward. Even after this it may be necessary to grind or remove the posterior occluding teeth, and if this is necessary, it should be done at the time of the operation. As the bone is dragged forward the saw-cuts gap in front, while at some place posteriorly the fragments remain in contact. This bone-gap must be filled with granulations, and the resulting bone-scar tends to contract for months afterwards, and unless permanent interlocking of the teeth is early established in the new position, some very hard-earned ground will be lost.

As the means of fixation I use the teeth, and have never had any satisfaction from any external adjuvant that I have tried. If the work is properly done, the teeth are sufficient. I have used all kinds of bands, but have found that the finest grade of soft iron wire (such as that used by florists) replaces these to advantage. An iron wire is passed around the crown of each of the selected teeth, fastened by two full twists, and one end cut quite short. It is not necessary nor advantageous to have the necks of the teeth constricted. Next, the long ends of an upper and a lower wire are twisted together, maintaining the tension while making the first twist. To hold the jaw forward, the upper second bicuspid or first molar is wired to the last available molar in the lower jaw with a No. 24 wire. This puts the pull in the right direction, and the strain is received on all of the molars in both jaws. To hold the chin up, the lower canines or first bicuspids are wired to the teeth directly above with a No. 26 iron wire. Here fracture-bands may be used, but they have no advantage over the iron wire. I have settled on this iron wire after trying almost every available material, for it is strong, does not stretch, is very pliable, and unless nicked by sharp-toothed instruments, will stand all necessary twisting. Unless there are a number of interlocking points of occlusion, quick-setting cement should be placed between the occlusial surfaces of the grinders; for if the wires are exclusively depended on, the retention will be painful and unsatisfactory.

In operating, place the jaw well forward, disregarding the immediate occlusion, unless it interfere with your ends; if it should, grind or remove the offending teeth. One of the most noticeable features of these cases is the obliquity of the chin. If we bring the incisors into occlusion, we have made use of only half of our opportunity, for, besides the receding chin, there is, in all probability, an increased subnasal angle.

If the lower incisors are brought one quarter or three eighths of an inch in front of the upper incisors, and the jaw held in that position, then, later, the orthodontist can, after extracting the first lower bicuspids, move the lower incisors and canines backward and the upper incisors slightly forward. By this the chin will be straightened, the subnasal angle lessened, and the patient given an immensely better profile. All the facial outlines must, however, be considered. The bringing forward of the lower jaw produces lateral protrusion, but in these cases this is usually desirable.

Two days after the operation the packing is removed from the wounds, which are closed by sutures put in, preferably at this time. When possible, the wires are left undisturbed for eight weeks. If before that time soreness of the teeth or other cause should necessitate their removal, they should be replaced, with or without an anæsthetic, on other teeth, if advisable, as early as possible.

Deformities of a third class of cases arise from another cause. Growth in the body of a normal mandible, between first dentition and

maturity, occurs in the incisor region, between the cuspids, giving mental breadth, and in the molar region behind the bicuspids, but not in the bicuspid region, these latter teeth occupying less space than the original deciduous molars whose place they take. Should growth occur here, there will be spaces between the teeth, and the deformity which we have placed in class 3 will result. Of course, as the inferior incisors are not confined, the forces which operated to produce the deformity in class 1 will operate here, and we shall have a further augmentation of the deformity by an increase in the angle and a shooting forward of the whole lower jaw. In these cases the lingual inclination of the incisors is always extreme.

To correct this condition, a different means must be adopted; that is, the removal of a piece of bone at the site of the growth; and as it is likely that the teeth have spread apart and the jaw as a whole has shot forward, the removal of one of the bicuspids on each side may be necessary. Where the lower jaw, as a whole, occupies a forward position, there will be lateral protrusion, for two reasons: 1. The broader posterior part of the lower jaw is brought opposite the narrow anterior portion of the upper; and 2. When this occurs, the pound of the jaw is taken, not on the buccal cusps of the lower molars, as is normal, but on a part nearer the lingual cusps. This tends to rotate the lower molars lingually, which is accompanied by an outward rotation of the lower border of the bone. Thus we have a real spreading at

Fig. 10. Illustration of the method of forming the new arch in cases of classes 1 and 3. The jaw shown in *A* is interesting on account of the bend at the site of the extracted first molar. It suggests the possibility of partially correcting cases of class 5 by the early extracting of the first molar on each side, in the hope that a chin-cap or the natural pull of the muscles would draw up the chin.

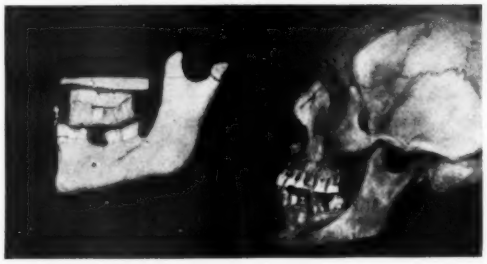

Fig. 11. Method of correction in cases of classes 1 and 3. The condition here was obtained by fitting a jaw-bone longer than that which originally belonged to the skull.

the lower part of the body. This lateral protrusion must also be corrected or compensation be made.

Sections of bone of the proper size are removed and the fragments brought together. The cuts are illustrated in Fig. 10 by the lines *AA*. *AA* and the sections *DD* are removed, then the fragments *CBC* are moved in and back to form the new arch *C'*, *B'*, *C'*, shown in dotted lines. The lateral fragments rotate on an axis corresponding, not to the last molar tooth, but to the temporomandibular articulation *OO*. Now, as the distance from the cut to the last molar *XX* is about one half that from the cut to the axis of rotation *XY*, the anterior end of the fragment will move in twice as far as does the last molar, which is about in proportion to the usual displacement at the two points. By this operation both the lateral and the forward protrusion is corrected.

In determining the location of the cuts and their directions, plaster models and X-ray should be used. Still, here, as everywhere else, the eye and the finger of the operator must be the surgeon's real guides and instruments of precision.

At first, on account of the lack of some way of fixing the lower jaw (which a gag by itself will not do), I used a double-bladed saw that would make two parallel cuts. This was a fairly efficient but not an ideal method, as, owing to the lingual inclination of the incisors, the pieces to be removed should be somewhat wedge-shaped. I have since devised a means of fixing the lower jaw which renders it possible to make very accurate saw-cuts. A block, or gag, is placed between the molars, which holds the mouth wide open, and by wires passing

from the lower to the upper teeth just in front of the gag the jaws are drawn towards each other and fixed. This stretches the temporomandibular ligaments and fixes the lower jaw.

Corresponding to the site of the bone that is to be removed, the skin lying under the border of the jaw is drawn upward and a cut three fourths of an inch long is made parallel with this border. This will render the scars inconspicuous when the operation is complete. The tissues are dissected from the outer surface of the jaw-bone, but without, on any account, injuring or even exposing the periosteum. The dissection is continued upward until the mouth is opened through the bucco-alveolar cul-de-sac, the mucous covering of the alveolus being left intact.

Before inserting the saw-blade the exact position of the first saw-cut is determined, and a flat piece of metal is inserted into the wound and turned on edge so as to rest against the bone just to the outside of and parallel with the first cut. This will serve both as a guide to the saw and protect it from the pressure of the soft tissues which would deflect it from its proposed course. The handle of a knife or the blade of another saw can be used for this purpose, but if the edge that rests on the bone is toothed, it will not slip, and if the protector is fixed on a right-angled handle, it can be used with greater ease. No matter what kind of a saw is used, for obvious reasons the bone should not be cut entirely through in any place until the fixation holes are drilled near the lower border and all of the other saw-cuts are at least three fourths of the way through. I have a mechanical saw, very narrow and probe-pointed (a nasal saw modified), that is run by a hand-power engine by means of a cable, that cuts very rapidly; but a sharp, narrow-bladed metacarpal saw will suffice, and in an unaccustomed hand is probably safer.

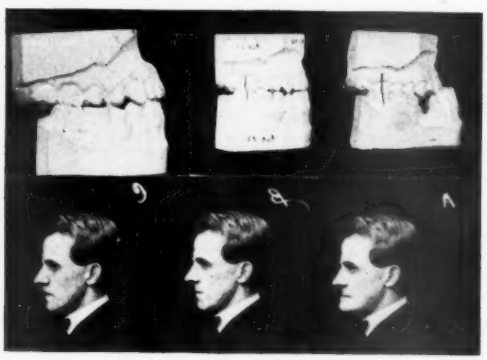

Fig. 12. Illustration of case of class 3.

A. Face and dentures before operation. This face is artificially reconstructed from cast of dentures and photograph of present condition, but is not an exaggeration.

B. Present condition of face and dentures. The teeth behind the canines are capped with gold crowns.

C. Reconstruction of face and dentures to show what would be the result of proper orthodontic treatment. Note that the chin is brought up and the septolabial angle lessened, which makes the nose less conspicuous. This particular case is reported in *Dental Cosmos*, August, 1906, and *Interstate Medical Journal*, September, 1906.

Lower piece of cast *C* is a little too far forward.

The means of splinting the fragments is important. Hulliham, in 1850, for a case in which he had resected and replaced the alveolus, devised a continuous metal splint cemented over all the teeth in the lower jaw. I first tried wiring the bones and the lower jaw to the upper. In commenting on a case of this kind on which I had operated, Dr. Angle suggested a metal splint made in three sections, which is to be cemented over the teeth before the operation. The portions of each side to be removed are not covered by the splint, and the adjacent ends of the splint serve as guides in the sawing. When the bone is removed, the ends of the three pieces of splint are fastened together, and fixation at the lower border of the bone is omitted. I would not dispense with the lower fixation in this operation. Proper fixation here consists of fastening the cut bones with wire, to be later removed, or chromicized catgut at their lower borders, and for the upper fixation use the Angle splint or by wiring across the cuts. Each of the teeth adjacent to the cut should in turn be braced by wiring it to its neighbor beyond. Next, the lower jaw is fastened to the upper by wires that pass to each of the three fragments. Here solidity will be gained by placing cement or softened gutta-percha at proper places between the occlusial surfaces, but space must be allowed for the taking of liquid food.

The face wounds have been infected from the mouth, and are sutured with small drainage-tubes in place. Good bone union should not be expected under eight weeks.

As stated above, the operation just described

is to be used also to correct deformities of class 1, as it is not practical to move the whole body of the jaw backward, as it would crowd the structures at the base of the skull.

Certain teeth have been suppressed symmetrically or asymmetrically, or have been extracted, and a shortening in one jaw or the other has resulted. If the shortening has occurred in the lower jaw, the operation devised for cases of receding jaw may be done on one or both sides, or a combination operation, such as resecting the ramus on one side and the body on the other, may be required to correct the lateral displacement of a lopsided lower jaw.

Shortening of the upper jaw will seldom offer occasion for surgical interference, though to make the lower conform to the receding upper would be simple.

We have already spoken of the yielding of the much-strained jaw body. The fifth form of deformity, as far as I can determine, appears to come from a yielding of softened bony arch between the occluding molars and the ramus when the body is prevented from sliding forward by the upper incisors. The softened arch bows upward and then hardens, and it remains arched. When the teeth belonging to the bowed section attain full eruption, they are on a plane above the normal, and, occluding themselves, cause the open bite in the anterior portion of the jaw. This is a fairly common

Fig. 13.

A. X-ray of an extreme case of open bite.

B. Diagrammatic reconstruction of same, showing cut for correction and splint in place. The upper half fits accurately, fixed by pins or wires and cement, the lower half fits very loosely, fixed by wires, modeling compound.

C. Shows diagrammatic reconstruction, with splint removed and molars in occlusion. The remaining open bite should be corrected by bringing down the teeth in the under-developed forward part of the maxilla and by extending the eroded teeth with artificial crowns. The white lines in *A* show another but untried suggestion for the bone-cut. The wedge to be removed, the jaw bent up, and an open V left below.

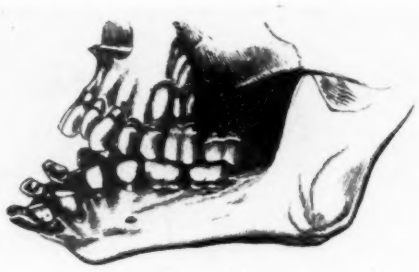

Fig. 14. The result of contraction of burns on the neck. From Tomes's *Dental Surgery*. Such a case was operated on in 1848 by Hulliham of Wheeling, West Virginia.

class. All except one of the cases of this kind that I have observed have shown evidence of rickets, which I think is the ordinary ætiological factor. The mouth will show greater or less evidence of the disease and the lack of development of the alveoli in the incisor regions, especially the superior, and the malformation and singular position of the teeth further complicate most cases.

It is likely that the surgeon will be consulted when the patient is between thirteen and sixteen, though the trouble became noticeable at the age of nine years. If the patient is still young and the deformity slight, the orthodontist can relieve it. After deciding to operate, the first thing to do is to determine the relative lengths of the two jaws, and whether, in correcting the deformity, the lower jaw should be lengthened or shortened. We have the choice of the two operations, and the use of X-ray and of plaster casts of the dentures will help us to choose. Another thing to determine is, how much of the open bite is due to the lack of development of the alveolus of the upper incisors, which is always present in these rickety mouths, and how much of this can be corrected by the orthodontist. If there is sufficient length of jaw to allow of a shortening operation, then a V of bone can be removed at the site of the greatest curve after removal of a tooth, and the jaw forced upward. If, on the other hand, removing a V would shorten the jaw too greatly, the bone-cut shown in Fig. 13 can be made with a chisel, a mechanical saw, and a crosscut reamer, through a three-quarter-inch skin-cut made under the jaw.

The jaw is then forced up. This latter operation should be done without opening into the mouth, the alveolus being broken without injuring its mucous covering. For this reason the tooth at the site of the proposed fracture should be drawn several weeks before. This cut is given this sinuous curve to produce a depression of the distal end of the anterior fragment. Otherwise, in some cases, the teeth just in front of the section (likely the second premolars) will come in contact with those above before the other teeth in the anterior fragment can be brought up to the occlusial plane. Adjustment should be produced by rotating the anterior fragment about an axis passing through the necks of the first premolars; that is, the second premolars are depressed, while the incisors are raised. Fixation in this class of cases, in my hands, has been very difficult, though in the report of the case operated on by Arbothnot Lane I am not aware that he makes any comment on this point.

My observation is, that, in extreme cases, if an immediate attempt is made to bring the jaw up in the new position, it is resisted by the digastric and the other muscles, passing from the anterior fragment to the hyoid bone. In overcoming this resistance, the hyoid is drawn up, and the tongue, which is large, is crowded into the smaller buccal cavity till breathing is greatly obstructed. Later, the pull of these muscles is apt to drag the bone into its old position. To overcome all of these difficulties I devised this splint, which is an adaptation of an old form of fracture-splint, and by its use, the mouth being held open, the muscles of the floor of the mouth are not strained, and do not antagonize the new position. If, in the course of the later operation, the wound from below should accidentally communicate with the mouth, it must be drained. I have done this operation both ways, and the shortening operation is the simpler to perform and less apt to be disappointing.

In the purely arbitrary classification I have given, I do not wish to convey the impression that I think that I have systematized the whole subject, but rather, for convenience, have made this grouping of those cases which have come under my observation.

There are other deformities which will have to be dealt with individually, but on the general lines which have been laid down. Contraction of scars from burns on the neck and chin can greatly affect the shape of the lower jaw. Though the title of this paper precludes their treatment here, it is germane to mention that deformities arising from unreduced unilateral or bilateral dislocations, malunion of fractures, etc., are to be corrected on these same lines.

The instruments should always include tooth-forceps and means for grinding the teeth. If the surgeon is not familiar with the use of these, there should also be present some one who knows how to use them. The surgeon should be thoroughly familiar with the strength and twisting endurance of the wire he is using.

Before operating, the patient should be in the best possible condition, the air-passages should be free, and foci of suppuration in any part of the body should be rigidly excluded.

The surgeon should, by prolonged study, have made himself thoroughly familiar with the anatomical condition which he will treat.

After the operation there will always be sufficient space between the teeth to take liquid, and in most cases semi-liquid, food. Nutrition and hygiene should be kept at the top notch. Rigid mouth asepsis before, during, and after the operation is the best prevention of sore and painful mouths.

These are legitimate operations in proper cases. I have seen both disposition and nutrition radically influenced for good, and in the case of women the resultant good cannot be estimated. I would advise no one to undertake any of them without first having the fullest confidence of his patient, for, during the convalescence, trying complications will arise, and the surgeon will find his patience and his resource taxed to the limit. Operations on cases of moderate deformity should not be undertaken lightly, for the unavoidable accidents of surgery can here put the operator in a most unenviable position. It is really surgical work, but work for the completion of which orthodonture is indispensable, and the earlier a competent, congenial orthodontist is associated in the case, the better it will be for both the surgeon and the patient.

FRACTURES

A Digest of Material Afforded by 250 Skeletons Examined in Rush Medical College

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SOME years ago, at Rush Medical College, the skeletons of all the cadavers dissected were macerated and cleaned for the use of the students. In the course of two or three years, 250 were thus prepared. They were macerated separately in large stone jars, and all bony residue saved and dried in separate piles on glass-top tables in the dissecting-room. These groups were then examined and records made of various normal and pathological or anomalous features. Among the pathological features, fractures furnished an interesting group, with numerous examples. The skeletons were all of adults, the majority being in the sixth and seventh decades. They came through the usual channels of the county morgue and the hospital for the insane at Dunning. The increased susceptibility to fractures of certain classes of the insane, particularly cases of long standing, is generally conceded, but only the fractures occurring during the actual period of insanity should be considered in this group. These skeletons were not distinguished from the others, and their role in the production of fractures, though probably small, is not known. Only intravitam fractures were recorded; none of these were of recent origin or in the healing stage.

FREQUENCY OF FRACTURES

Of the 250 skeletons, 31 were of females and 219 of males. The number presenting fractures — that is, the evidence of previous fractures — was 106; 95 males and 11 females. The total number of fractures, including as single instances certain multiple fractures to be mentioned later, was 182. Fractures were present in 42.4 per cent of all cadavers.

Applying this ratio to the living adults of the sixth and seventh decades, over forty in every hundred, or nearly one half the total number, will at some time have suffered from fractures. This ratio of frequency may be modified by an increased number of observations, and may vary with different classes of individuals. The cadavers examined are presumably more apt to have belonged to individuals of the extra-hazardous class, and therefore to have more fractures than average persons. However, very few persons who live out their full term of years amid the vicissitudes of our modern complex industrial civilization escape entirely the hazards of this class and their consequent injuries. All things considered, the ratios obtained by increased numbers of observations and in different classes of individuals will probably vary little from that already given.

The great majority of fractures occur in adults and leave visible evidences in the bones. It is probable that similar evidence of fractures occurring in earlier years is not infrequently entirely effaced, and is not to be recognized in the skeleton of the adult. Necessarily leaving such instances out of enumeration, the high percentage of frequency given is probably not excessive, and would not be materially affected by further series of observations.

There is no other surgical lesion as serious as a fracture occurring as frequently or affecting as large a proportion of the population.

Clinical statistics afford a very incomplete idea of the actual frequency of fractures. Hospitals, the usual sources of such statistics, receive only the severer or less frequent ones; a large number treated by physicians outside of hospitals do not enter into statistics, and a still further not inconsiderable number of the less obtrusive fractures, as the slighter ones of the nose and many of the ribs, receive no professional treatment at all, and are never seen by a physician. Autopsy statistics are also very deficient, as they concern only recent fractures, or such others as for various reasons are more or less obtrusive. The relative frequency of fractures of different regions has been determined by clinical statistics from large numbers of hospital and dispensary reports. The influence of age, sex, occupation, etc., has also been studied from similar sources, and the tabulated deductions are familiar to all. The

statistics of relative frequency, etc., have the limitations of hospital statistics in general and reflect hospital experience only. However useful in practice, they do not represent the true conditions. The relative frequency of fractures of different regions will vary very little under different social conditions. An increase in the hazard of living is accompanied by an increase in the total number of fractures, but the frequency of those of one region as compared with those of another will remain practically the same. Of first importance for the purpose of comparing with each other as well as with the total population, must of necessity be the complete enumeration of all fractures. This is most nearly accomplished by examining the skeletons.

Of 250 skeletons, 64, or practically one fourth, presented evidences of fractured ribs. Thirty-five per cent of all fractures (182) were of the ribs.

This relative frequency of fractured ribs is not determined by counting the actual number of ribs fractured, but by considering this lesion as a single instance of fracture in each individual affected, though frequently the fractures were multiple. The actual number of ribs fractured was 212. Were these, and other instances to be mentioned later, to be considered as single fractures, the real total would be double the 182 previously given; but it seems better to consider these fractures and some others in groups, as they are, in effect, practically the same as single fractures. Fractured ribs far exceeded all other fractures in frequency. One fourth of all cadavers had them, and one third of all fractures belonged to this group. Other features of these fractures will be referred to in another place.

Next in frequency to the ribs come fractures of the nasal bones, with a record of 36 cases, or 14.4 per cent of all the skeletons examined. These, like the ribs, were considered as single instances of fracture, though fracture of both bones was the rule, as in 24 cases. Fractures of these bones constituted 19.8 per cent of all fractures recorded. It is improbable that any number of equally complete observations will materially affect the predominating frequency of these two over all other fractures, including, as they do in this series, over one half of the total number of fractures recorded.

A not infrequent accompaniment of fracture of the nasal bones is fracture of the nasal process (processus frontalis) of the superior maxilla. This occurred in eleven individuals, in two of whom both sides were affected. It did not occur independently of fracture of the nasal bones. After the ribs and nasal bones already mentioned, this fracture was equaled in frequency only by fracture of the fibula, which also occurred in eleven individuals. Fractures of the superior maxillæ were present in 4.4 per cent of all cadavers. They constituted six per cent of the total number of fractures. The same respective percentages also obtain for fractures of the fibula.

Further observations would doubtless destroy the parallelism between these two classes of fractures, and probably in favor of the maxillæ, as about one third of all nasal fractures involve these bones.

Following these are the fractures of less frequent occurrence, furnishing material too limited for serious considerations of frequency, though possessing other features of interest.

INFLUENCE OF SEX

Thirty-one female and 219 male skeletons were examined. Eleven female and 95 male skeletons presented fractures. Twelve and four tenths per cent of all cadavers were females, and 87.6 per cent were males. Ten and three tenths per cent of all skeletons presenting fractures were of females. Eighty-nine and seven tenths of all skeletons presenting fractures were of males. Thirty-five and five tenths per cent of all the female skeletons presented fractures. Forty-three and four tenths per cent of all the male skeletons presented fractures. Eleven females presented eleven instances of fracture, or an average of one apiece. Ninety-five males presented 170 instances of fracture, or an average of 1.8 apiece.

While only a slightly greater proportion of males suffered from fractures, as 43.4 per cent is to 35.5 per cent, the number of fractures received by each of the males affected was nearly twice that of the females, or as 1.8 is to 1.

Clinically, the relative frequency between the sexes varies considerably at different ages, approaching at the extremes of life and separating widely in the middle period, but giving a

general relation of three fractures in males to one in females. The discrepancy here between the actual and the clinical is probably due to the better enumeration in the former of the usually unrecorded fractures.

SPECIAL FRACTURES

Ribs. As previously mentioned in compiling the total number of fractures, those of the ribs, nasal, and some other bones were considered as single instances of fracture in each individual affected, although in several cases over one half the ribs were broken. Thus while the whole number of individuals affected was 64, the total number broken more than trebled that number. These fractures were present in 25.6 per cent of all cadavers, and they constituted 35.1 per cent of all fractures recorded.

The skeletons were examined in three series of 88, 50, and 112 skeletons, respectively. In the series of 88, 25 individuals, or 28.4 per cent, presented these fractures; in the series of 112 skeletons, 22, or 19.6 per cent, were affected; and in the group of 50, 17, or 34.7 per cent, had fractured ribs. The high general percentage of these fractures is not an accidental occurrence, but one likely to be very little affected by more extensive observations.

It is more than probable that in some cases the multiple fractures were consecutive, or received at different times, and should be considered as separate instances of fracture. All such cases would still further increase the total instances of fracture as well as the percentage of frequency for the ribs. They would not change the total number of individuals having these fractures, but would increase the separate instances of these fractures in the same individuals.

The total number of ribs broken in 64 individuals was 212, or an average of 3.3 ribs to each person. Of this number, 111 were on the right side and 101 on the left. The right side was involved alone 23 times, with a total of 53 fractures; the left side alone, 17 times, with a total of 36 fractures. Both sides were involved together 24 times, or in 37½ per cent of the cases. The right side was involved altogether 47 times; the left side, 41 times. The average number of ribs broken in the 47 cases on the right side was 2.3; the average in the 41 cases on the left side was 2.4. The average number of ribs broken in the 23 fractures of the right side alone was 2.3; the average in the 17 cases of the left side alone was 2.1. The average number of ribs broken in the 24 cases involving both sides was 5.1.

The right side was affected oftener than the left, but the severity of the injuries, considering the average number of ribs broken, was slightly greater on the left. No significance is attached to this, however, as the differences are very small, and another series of observations could easily reverse their relations. In the 24 cases where both sides were affected together, the average of 5.1 fractured ribs to each individual is much above the general average of 3.3 ribs for each, and more than double the highest average of 2.3 for fractures limited to one side only. This is a mathematical justification for the very natural presumption that these injuries involving both sides are, as a rule, severer than those limited to one side only.

In each of nineteen instances the fracture was limited to a single rib. In seventy per cent of the skeletons presenting fractured ribs, more than one rib was involved.

The largest number of fractured ribs observed in one person was sixteen; seven on the right side and nine on the left.

On the right side, the third, fourth, fifth, sixth, tenth, eleventh, and twelfth ribs were broken, the fractures all being single. On the left side all the ribs below the third were fractured, the fourth and twelfth only being single; the fifth presented two fractures; the sixth, seventh, and eighth, four fractures each; the ninth, three fractures; the tenth, four fractures — one ununited; and the eleventh, two fractures.

There were, in all, 32 separate fractures of the ribs. These fractures were not comminuted, but occurred at definite intervals; in those presenting four fractures they were recorded, "just outside of the tubercles, one fourth, one half, and three fourths," as the respective distances from the heads of the ribs. The skeleton was that of an old man who had suffered from a generalized osteoarthritis, and presented, in addition to the fractures of the ribs, a compression fracture of the body of the fifth cervical vertebra, fracture of both nasal bones, fracture of the first right metatarsus, fracture of the exter-

nal malleolus of the fibula, and outer tuberosity of the tibia.

Multiple Fractures of Single Ribs. Nine subjects, or one seventh of the total number with broken ribs, presented multiple fractures of single ribs. In eight of these, double fractures had occurred. In the ninth subject, that of the old man mentioned above, besides single fractures in the fourth and twelfth ribs, double fractures had occurred in the fifth and eleventh ribs, triple fractures in the ninth rib, and quadruple fractures in the sixth, seventh, eighth, and tenth ribs.

Multiple fractures involved ribs in number from the third to the eleventh, and in extent, from the neck of the rib to the anterior one fourth. Bony union with a limited amount of callus was the rule; ununited fracture, the rare exception.

Classification by Regions. The fractures were classified by regions into three groups: An upper, including the first two ribs; a middle, including all the ribs from the third to the eleventh; and a third group for the last, or twelfth, rib.

Five ribs were fractured in the first group; the second was involved four times, and the first rib once. It was fractured near the middle of the shaft, and was not accompanied by fracture of the clavicle. In the middle group, 194 ribs were fractured, and in the third group the last rib was involved thirteen times. In one instance fracture of the twelfth rib occurred on both sides.

The middle region, including three fourths of the ribs, naturally received the most fractures, while the last rib received more than the first two in their well-protected positions.

The twelfth rib was involved in 18.7 per cent of all skeletons with rib fractures.

Portions of Ribs Affected. Sixty-one ribs were fractured at or near the middle. Eighty-one were fractured behind the middle; most of them near the angle. Ninety-five were fractured in front of the middle, the majority about half-way between the middle and the sternum. Fracture of the twelfth rib usually occurred about an inch from the head, the only fixed part of the bone.

One fourth of the fractures occurred at the middle of the shafts. The remaining three fourths were nearly equally distributed to the above-mentioned anterior and posterior regions, the preponderance being slightly in favor of the anterior region.

Nasal Bones. Fractures of these bones were present in 36 skeletons, or 14.4 per cent of all cadavers. They constituted 19.8 per cent of the total number of fractures observed. Five had single fractures upon the right side; seven had single fractures upon the left side; while in twenty-four, or two thirds of the total number, both bones were broken. Four were in females and thirty-two in males; a fair distribution between the sexes, considering the number of male and female cadavers examined. Eleven cases were accompanied by corresponding fractures of the nasal processes of the superior maxillæ. In twenty-four cases the fractures occurred at the middle or lower. In twelve cases its position was not recorded.

Deformity. This was mentioned in twenty-five cases, and was usually slight. Depression and right and left deflections were the varieties observed. Firm union with a scanty amount of callus, sometimes insufficient to fill completely the line of fracture, was the invariable rule.

Superior Maxillæ. Fractures limited to the nasal processes of these bones were observed in eleven skeletons. They were always accompanied by fractures of the corresponding nasal bones. In two instances both sides were affected. The deformity, when present, was that of the nasal bones. These fractures constituted six per cent of the total number, and over four per cent of all cadavers presented them.

Cranium. Two fractures involved the cranium. In one a bullet was lodged in a depression in the great wing of the sphenoid in the right temporal fossa, with slight splintering of the inner table. The other was a circular depressed fracture three fourths of an inch in diameter over the left frontal eminence, with a slight corresponding internal elevation of half the diameter of the external lesion.

Spine. Five skeletons presented fractures of the spine. In four the lumbar vertebræ were affected, and in one a cervical vertebra. They constituted 2.7 per cent of all fractures, and occurred in 2 per cent of all cadavers.

Bodies. In the cervical vertebra and in one of the lumbar vertebræ the body presented a depressed or compressed fracture in which the anterior one half or three fourths of the upper surface was on a lower level than the rest of the surface nearer the arch. The depression, which is abrupt, amounted to one eighth of an inch in the large lumbar vertebra. In both cases the bones were very fragile.

Transverse Processes. These processes were fractured in four instances, all in the lumbar region. In one instance this fracture was associated with that of the body, in the case mentioned above; in the other three they were limited to the processes. The processes involved were of the second and third, the second, third, and fourth, the third and fourth, and the fourth vertebræ, respectively, in the four cases concerned. The third and fourth, the longest processes, were involved three times each; the second was involved twice. Isolated fractures of these processes constituted one and six tenths per cent of all fractures, and occurred in over one per cent of all cadavers.

Scapula. This bone was fractured five times; four times on the right side and once on the left. Four fractures affected the body below the spine, commencing at the vertebral border and extending outward, in two cases to the axillary border. The deformity was slight and the union firm, with a minimum amount of callus, fenestra occurring along the line of fracture.

One fracture affected the anterior half of the glenoid cavity, splitting and partially separating that portion from the rest of the bone. It was accompanied by a corresponding indented fracture on the head of the humerus. Fractures of this bone constituted 2.7 per cent of all fractures, and occurred in 2 per cent of all cadavers.

Clavicle. This bone was broken eight times, its fractures constituting 4.4 per cent of all fractures. It occurred in 3.2 per cent of all cadavers. Four were fractured at the outer third, with right-angled deformity; three were fractured near the middle, with slight deformity; and one was fractured one inch from the sternal extremity, with slight deformity.

Humerus. This bone was fractured in seven cadavers, or in 2.8 per cent of all examined. In one instance both humeri were fractured at their surgical necks. Fracture of this bone constituted 3.8 per cent of all fractures. In two compression fractures the sharp borders of the glenoid cavity fit into reciprocal depressions in the articular surfaces of the heads; once at the anterior part — associated with fracture of the glenoid, previously mentioned — and once at the posterior part. The other fracture of the head was impacted, and involved the tuberosities. The bones in the three cases were brittle. One of the fractures of the surgical neck was accompanied by a corresponding fracture of the olecranon.

Ulna. This bone was fractured five times. In no instance was it accompanied by fracture of the radius. One comminuted fracture involved the olecranon, with accompanying fracture of the neck of the corresponding humerus. They were probably synchronous. The other four fractures involved the shafts; two at the middle, one at the lower third, and one at the lower fifth. Union was firm and deformity slight. Fracture of this bone constituted 2.7 per cent of all fractures, and occurred in 2 per cent of all cadavers.

Radius. The radius was fractured twice, both Colles. Its fractures constituted 1.1 per cent of all fractures, and occurred in 0.8 per cent of all cadavers.

Fractures of the wrist and hand were not observed.

Femur. Fracture of the femur was found four times, constituting 2.2 per cent of all fractures. It occurred in 1.6 per cent of all cadavers. The neck was involved in two cases, both males. Union with excessive callus measuring 9¼ inches in circumference, deformity, restricted motion, and much shortening occurred in one case. In the other, the head was nearly or quite fixed in the acetabulum, while a false joint between its outer surface and the shaft and trochanter — the neck being absent — allowed considerable movement. The other fractures were in women, and affected the great trochanter and the condyles, respectively.

Patella. Fracture of this bone occurred but once, and involved the outer angle in a longitudinal direction. Union was firm.

Bones of the Leg. Fractures involving both bones occurred in eight cases, all males. They were probably concurrent. The tibia alone

was fractured in one case, the injury involving the lower end. The fibula alone was fractured in three cases. The injuries occurred at the upper third in one, at the upper fourth in another, and at the upper fifth, middle, and lower third in the third case, which showed evidence of three fractures.

Of the fractures involving both bones, six were of the shafts. One involved a portion of the external malleolus below and the outer tuberosity of the tibia above. One involved the lower fourth of the fibula and the internal malleolus of the tibia. These last two would probably pass clinically as Pott's fractures, though neither is typical. None of the fractures of the fibula were true Pott's fractures. In four of the six cases involving the shafts the tibiæ were broken at the lower third. The accompanying fibular fracture occurred at the upper fourth or third in three of these cases, and opposite the fracture in the tibia in one. In the other two cases, both bones were broken at the upper fifth in one, and at the middle or just below in the other.

Fractures of the leg involving both bones (sixteen fractures) constituted 8.8 per cent of all fractures, and occurred in 3.2 per cent of all cadavers. Individually, there were nine fractures of the tibia and eleven of the fibula, constituting, respectively, 4.9 per cent and 6 per cent of all fractures observed, and occurring in 3.6 per cent and 4.4 per cent of all cadavers examined.

Tarsus. Two fractures of the os calcis and one of the astragalus were observed.

Os Calcis. One was a longitudinal, splitting fracture, with very little interference with function, and the other was a fracture of the sustentaculum tali with its subsequent union with the astragalus.

Astragalus. This fracture was of an indefinite character, associated with an osteoarthritis.

Metatarsus. The first metatarsus was fractured twice, the fourth twice, and the second once, making five fractures of these bones, representing 2.7 per cent of all fractures observed.

Phalanges. Two fractures, both of the first phalanges, one of the great toe and one of the little toe, were observed.

The Foot as a Whole. Ten fractures occurred in the foot; three of the tarsus, five of the metatarsus, and two of the phalanges. These fractures constituted 5.2 per cent of all fractures, and occurred in 4 per cent of all cadavers.

Pelvis. Two fractures of the pelvis were observed. One was probably an early fracture of the tuberosity of the left ischium, with three fourths of an inch outward deflection. The other was a transverse fracture through the third sacral vertebra and lateral masses, with slight increase in the curvature, the innominate and coccyx being uninjured. Fracture of the pelvis constituted 1.1 per cent of all fractures, and occurred in 0.8 per cent of all the cases.

The following bones or groups of bones presented no fractures: Os hyoides, sternum, coccyx, carpus, metacarpus, phalanges of the hand, and some of the individual bones of the skull and tarsus. Very few regions or bones were exempt from fractures. The accompanying table is a summary of the fractures and their relative frequency.

TABLE OF FRACTURES OBSERVED IN TWO HUNDRED AND FIFTY SKELETONS, AND THEIR RELATIVE FREQUENCY

Bones or Regions Affected	Number of Skeletons Presenting Fractures	Percentage of Cadavers Affected	Percentage of Total Fractures Observed
Cranium	2	0.8	1.1
Nasal bones	36	14.4	19.8
Superior maxilla	11	4.4	6.0
Skull, including face	(38)	(15.2)	(26.9)
Scapula	5	2.0	2.7
Clavicle	8	3.2	4.4
Humerus	7	2.8	3.8
Ulna	5	2.0	2.7
Radius	2	0.8	1.1
Forearm	(7)	(2.8)	(3.8)
Ribs	64	25.6	35.1
Os innominatum	1	0.4	0.5
Sacrum	1	0.4	0.5
Pelvis as a whole	(2)	(0.8)	(1.1)
Spine	5	2.0	2.7
Femur	4	1.6	2.2
Patella	1	0.4	0.5
Tibia	9	3.6	4.9
Fibula	11	4.4	6.0
Bones of the leg together	(8)	(3.2)	(8.8)
Tarsus	3	1.2	1.6
Metatarsus	5	2.0	2.7
Phalanges of foot	2	0.8	1.1
Foot as a whole	(10)	(4.0)	(5.2)
Total fractures	182		99.4

DEPARTMENT OF TECHNIQUE

THE TECHNIQUE OF HIP-JOINT AMPUTATION[1]

With Report of Five Cases

By BENJAMIN BRABSON CATES, M.D., Knoxville, Tennessee

Aside from the depressing effects of the anæsthetic and the sequelæ incident thereto, there is always a greater or less amount of danger following the separation of the body from some of its essential parts, which, in the case of a limb, increases the dangers as one approaches the trunk.

In view of the known drawbacks to amputation at the hip-joint, it behooves the surgeon to be exceedingly careful, to be on his guard, and to be forearmed, so that he may minimize these dangers.

The chief immediate dangers of amputation at the hip-joint are shock, hemorrhage, and infection.

In regard to shock, an ounce of prevention is worth a pound of cure; so, other things being equal, and time permitting, the surgeon should prepare the patient with exceeding care beforehand, by the use of such known mechanical and therapeutic agents as will hold the nervous and vascular systems in the even tenor of their ways.

The surgeon should never lose sight of the danger of hemorrhage in this operation, of both the primary and secondary variety. He should be extraordinarily careful to leave no vessel, however small, either artery or vein, untied.

For guarding against infection, one should remember the large area of connective tissue exposed to invasion, and the almost impossible task of preventing the entrance of microbes into this new field; to wit, in such diseases as tuberculosis of the joint, with mixed infection, or traumatic gangrene with emphysema. Therefore one should be exceedingly careful to use every precaution to prevent infection.

Now, in the consideration of hip-joint amputation, I shall eliminate emergency cases, such as railway and machinery accidents, accompanied with loss of blood, crushing, and shock, which require immediate operation. Though these cases are less favorable, the technique of the operation and the subsequent treatment are practically the same.

A case for hip-joint amputation, such as I shall refer to, should be divided into pre-operative, operative, and post-operative.

I. PRE-OPERATIVE STAGE

Those cases especially incident to wasting diseases, like tuberculosis, if not too urgent, should be given a supporting treatment for a few days or weeks, including plenty of good, fresh air, nutritious diet, and those therapeutic agents that will enrich the blood and increase the blood's hæmoglobin.

II. OPERATIVE STAGE

The patient having been duly prepared and placed in position, the surgeon selects the technique with which he is most familiar, and which offers the best chance to him to diminish the dangers of hemorrhage and shock. He should bear in mind that he is playing against time; that he should work rapidly, without being in a hurry, in order that he may avoid those twin evils of operation, shock and hemorrhage. In other words, the surgeon should do the work in the shortest time possible with safely to his patient.

I shall not elaborate upon the different methods of hip-joint amputation. Indeed, the scope of this paper will not permit of my doing so; but, later on in my discourse, I will narrate the technique I practised in my cases, and attempt to show to this society the advantages and disadvantages of the methods most in vogue.

III. THE POST-OPERATIVE STAGE

This stage includes, besides the use of restoratives to meet the exigencies of the case, the proper treatment of the stump. This, also, I will dwell on at some length in speaking of the technique of the operation.

In case there is an infected joint, with necrosis of a considerable amount of tissue, it is best, after the removal of the necrotic material, to treat the stump for a few days as an open wound, because, at times, in spite of the most thorough drainage, there will be considerable sloughing follow the operation, and should infection of the entire wound take place, one would have to combat an enormous sloughing stump, with its remote evils, sepsis and secondary hemorrhage.

[1] Read before the Tri-State Medical Societies of Alabama, Georgia, and Tennessee, Chattanooga, Tennessee, October 3, 1906.

If, on the other hand, one has a clean stump to deal with, the proper method is to close the wound, with proper drainage and copious antiseptic dressings.

With these preliminary remarks I shall present to this Society five cases operated on during my term of service at the Knoxville General Hospital, during the years 1904 and 1905, with the technique of the operation and the subsequent management of each case. I shall leave to each individual member the right to choose the method he prefers, reserving the right, however, from my limited experience in the given operation, to point to what, in my opinion, is the best method of operating on a case of that kind, at the same time calling attention to defects of technique in some methods generally practised.

CASE 1. Robert Wells, male, white, aged 33. Mother died of fever. Four brothers and two sisters; all in good health. In 1895, he had pleurisy. He never fully recovered. His health continued poor, showing the usual ups and downs of a tuberculosis patient. In 1901 his right hip developed an abscess, which discharged large joint quantities of pus. He was operated on, the joint exposed, curetted, and drained, without benefit. His health not improving from the constant drain on his system, he entered the Knoxville General Hospital for operation.

February 4, 1904, assisted by Dr. C. Deaderick, I did a hip-joint amputation by Wyeth's method. The patient rallied well from the operation, improved slightly under a supporting treatment; but, becoming dissatisfied on account of the withdrawal of his usual allowance of morphine, he left the hospital over my protest before the wound healed. He was treated at his home by different physicians. This patient lived seven months after the operation, dying at last from general tuberculosis. A small sinus at the stump discharged till his death.

CASE 2. John Hardwick, male, colored, cook, aged 21. Mother died of a tumor. One sister died of a tumor in her side, at 14 years of age. He had the usual diseases of childhood. In January, 1904, he had a pain with swelling in his right foot, followed by a tumor behind the knee, the size of an orange. This tumor extended up the thigh, on the outside.

In the spring of 1904 he entered the Knoxville General Hospital, and was operated on by one of the attending physicians for this tumor, which proved to be a lymphosarcoma.

In the latter part of the fall of 1904, the tumor returning, he came back to the hospital November 21, 1904, during the term of service of Dr. T. Ap R. Jones, who turned him over to me for operation. November 26, 1904, I did a hip-joint amputation by Wyeth's method, removing also all the lymph-glands in the groin. I closed the wound, using gauze wicks for drainage. During the operation, one of the Wyeth's pins on the outside of the thigh broke, and I came near losing my patient from hemorrhage. The patient was put to bed in a bad condition, but subsequently rallied under the use of normal salt solution under the skin. The wound healed rapidly, and he lived three months, subsequently dying from an enormous secondary growth in the left side of his chest.

CASE 3. This case was referred to me by Dr. J. P. Tillery. The patient, a strong, healthy farmer, had his foot caught in a hay-baler in January, 1905, and sustained a compound fracture of the lower third of the tibia and fibula on the left side, which was followed by rapidly spreading traumatic gangrene. I saw him first on January 6, 1905.

There was incipient gangrene of the limb below the knee, with swelling and wide-spreading phlegmon of the entire thigh. He lived ten miles out in the country. I advised that he be brought to the Knoxville General Hospital for hip-joint amputation. This was done two or three days later. January 10, 1905, assisted by Dr. Tillery, I did a hip-joint amputation by Wyeth's bloodless method. The necrosis had affected all the soft tissues of the entire limb, even extending up over the hip and lower part of the abdomen. Removing all necrotic tissue visible to the naked eye, I closed the wound with several gauze drains in different parts of the stump. Notwithstanding the shock of the operation, and the profound systemic infection, the patient rallied wonderfully under stimulants and the use of normal salt solution. However, the following day, signs of necrosis appearing in the stump, all stitches were removed, and the wound was treated with compresses saturated with mild antiseptic solutions. All the connective tissues in the stump up to Poupart's ligament in front and the crest of the ilium behind sloughed. The patient, after a long fight, and under a supporting treatment, finally recovered, and is well to-day, as fine a looking picture of health as one is likely to see.

CASE 4. The following history of a male patient who came under my notice during my term of service at the Knoxville General Hospital during the winter of 1904 and 1905 is interesting. At that time he was 47 years old; white; laborer. He has a good family history.

Thirty years previous to the operation, he was struck on the right knee by a stone. In a day

or so afterward, his knee began to swell, and to pain him. This swelling soon broke through, and discharged pus. From the day of injury until the limb was amputated, he had no surcease of pain.

An examination of the patient showed a much emaciated, sallow man, with his right lower limb wasted, and several sinuses from his knee to his groin discharging a fœtid pus with a very offensive odor. The upper sinus reached to the great trochanter. I proposed an amputation at the hip-joint, which was accepted.

January 17, 1905, assisted by Dr. A. G. Kern, I amputated at the hip-joint by the dissecting method. The joint was not involved. I then closed the wound with drainage. The patient rallied well, and recovery progressed favorably for a day or so, when necrosis appeared in one corner of the wound. I removed all the stitches, and treated the stump by the open method, with copious antiseptic dressings. The entire wound became infected, and the whole stump sloughed. After a long while under the antiseptic treatment, and with supporting measures, he recovered, and is well to-day. In disarticulating the head of the femur, some pus from one of the sinuses ran over the surface of the wound, in spite of all precautions I had taken to prevent it. This no doubt infected the wound, and caused the necrosis.

Case 5. George Etherton, white, aged 26. Had hip-joint trouble for five or six years. I operated on him four years previous to amputation by opening the joint, curetting and drainage. This operation was a failure. I did not see him again for three or four years, when he returned for further treatment.

His condition at the time of the operation was as bad as could be. He was very much emaciated, his thigh was drawn up on his abdomen; several sinuses over his thigh and in Scarpa's triangle discharged foul-smelling pus. The inguinal glands were a mass of necrotic tissue.

May 5, 1905, at the Knoxville General Hospital, assisted by Dr. C. Deaderick, I amputated at the hip-joint by the dissecting method, first tying the external iliac artery and vein above Poupart's ligament, on account of the mass of necrotic tissue in Scarpa's triangle.

On opening the joint, I found the head of the femur nearly eaten away, and the entire iliac bone, nearly to the crest of the ilium, worm-eaten and rotten. This I removed. I also removed all the inguinal glands and necrotic tissue in Scarpa's triangle.

The patient stood the operation fairly well, until I was ready to close up the wound, when he suddenly collapsed. Heart-beat and respiration stopped. Putting him in the Trendelenburg position, I hastily opened a vein in his arm, and introduced a pint of hot saline solution in his veins. After a short time, he began to show signs of life, rallied, and lived four days after the operation.

These five cases were operated on within fifteen months, four of them within eleven months, during my term of service at the Knoxville General Hospital. Four of these patients recovered. One lived three months, one lived seven months, and two are now alive and well, after nearly two years. At one time I had three consecutive hip-joint cases in less than two months in the same hospital. They all recovered from the operation. One lived three months; two are living after twenty months, well and hearty.

In making choice of method in this "most formidable amputation," one naturally wants to make use of the safest and easiest technique. Undoubtedly, in my opinion, the safest and easiest method, and the one I shall use in the future, is the dissecting method. It offers the best means of controlling the hemorrhage and the quickest method of effecting disarticulation, the time being being one half less than that with the pins.

The Wyeth pins are in one's way when attempting to disarticulate, after dividing all the soft tissues down to the bone. In my second case the accident of a broken pin came near costing me the life of the patient. The dissecting method is extremely easy. Make a circular incision through the skin, six inches below the joint, and extend it up the outside of the thigh over the great trochanter, making an external racquet. Then dissect back the cuff of skin to the point were the muscles are to be divided. When this is done, ligate the common femoral artery and femoral vein separately, with two ligatures, and divide the vessels between them. Having done this, with a knife make a circular sweep of all the structures down to the bone, then clear the neck of the bone, and while an assistant alternately makes internal and external rotation, divide the muscles attached to the trochanters. Open up the capsule in front.

When the capsule is opened up in front, the assistant prizes the head out of the acetabulum, while the operator carries the knife down behind the head of the bone, completely dividing the capsule.

Having effected the removal of the limb, examine carefully for any spurting vessels, and if any are found, tie them. Then apply a large gauze compress rung out of hot salt solution in the cavity, bring the flaps over it, and use pressure for a few minutes to stop any capillary oozing.

When the hemorrhage has all stopped, make a large counter-opening in the posterior flap for drainage. Don't neglect this. Put in a gauze or cigarette drain in the counter-opening, and one in each angle of the wound down to the acetabulum. Introduce some deep catgut sutures through the muscles of the stump. Then bring the skin-flaps over all with deep retention and superficial sutures. Apply a copious antiseptic dressing.

If, on the other hand, the wound is infected, it is better to treat it as an open wound until the surface is covered with healthy granulations, when the edges of the skin may be brought together with sutures, as in a non-infected wound.

THE EXAMINATION OF UTERINE SCRAPINGS

An Improved and Shortened Method

By ELLICE McDONALD, M. D., New York City

The use of the microscope in the diagnosis of carcinoma of the uterus is a most important aid in the early recognition of the condition. The usual rapid methods of preparing these scrapings are open to objection. The freezing methods, while most useful in the examination of solid tissue, are apt to be misleading in the examination of small pieces of tissue, when the relation of the cells one to the other is important. This relation of the parts of the tissue is of especial importance in carcinoma of the cervix, where the distortion of the relations may lead to a diagnosis of carcinomatous invasion. Gelatin or some other substance is used to make the scrapings adhere before freezing, but even this is not reliable.

It is difficult to obtain serial sections, so useful in the diagnosis of malignancy by the freezing method. Staining of the tissue of the uterus is usually poor after it has been frozen.

The ideal method is one in which the suspected tissue is made to adhere firmly to a base which will keep the component parts in perfect relation until it comes to the microscope.

It is also seldom that it is necessary to do a complete operation at the same time as the clipping or scraping is taken for diagnosis. When immediate operation is not intended, there is no urgent haste in the examination, and a few hours allowed to the method reported here will give a surer and more satisfactory basis for diagnosis.

When uterine scrapings are taken, they are put immediately into salt solution, and kept there until they are brought to the laboratory. They are then taken out and placed upon firm, soft blotting-paper. This paper should be thick and of good quality. I have usually obtained such from the blotting-pads sent out as advertisements by banks. The scrapings are put upon pieces of the blotter about two centimeters square, and then arranged in the proper relations. The excess of fluid is drawn away by the edge of another blotter. The scrapings should not be laid too thickly. The square of blotter is then grasped on each side by tissue-forceps and carefully laid in the mixture of formal-alcohol. The specimen is left there for an hour, when it is removed and cut down to a square of one centimeter. This should be done with a large, sharp pair of scissors, cutting directly through the blotter and the tissue. The square of tissue may then be easily handled and passed through the various other solutions. It may be left longer in any of the solutions, except aniline oil. A small piece of tissue requires less time than a large one.

I have sections from tissue prepared after this method, made three years ago, and they show no deterioration. They were cut upon a Minot microtome and from 3 to 6 μ thick. Serial sections are easily obtained, and staining is much improved. The whole process may be hastened by placing the solution in the incubator, but in this case it requires careful attention. The method is as follows:

1. Receive the scrapings in salt solution.
2. Place upon blotting-paper.
3. Alcohol, 95 per cent; formalin, 10 per cent. One hour.
4. Cut to small size with scissors.
5. Alcohol, 95 per cent. One hour.
6. Alcohol, absolute. One hour.
7. Aniline oil. One hour.
8. Xylol. One hour.
9. Paraffin. One hour.
10. Imbed and cut with Minot's microtome.

FERNAND HENROTIN, M. D.

DEPARTMENT
NICHOLAS SENN FESTSCHRIFT

DR. FERNAND HENROTIN

A Commemorative Address

By DR. NICHOLAS SENN

"He is not dead, this friend — not dead,
But in the path we mortals tread
Got some few faltering steps ahead,
And nearer to the end."

FOR the first time, the ranks of the Nicholas Senn Club have been invaded by death. In the selection of his victim, the grim reaper grasped with his cold, unfeeling hands and removed from our midst one who had endeared himself to us all by his many virtues, one of the most active and enthusiastic organizers of this club — our first President, Dr. Fernand Henrotin.

An empty chair in the family circle is always a sad reminder of the uncertainty of life, and a source of profound sorrow; but, when death claims the life of a benefactor of the human race, in the full vigor of his manhood, and at the zenith of his usefulness, it must be regarded in the light of a public calamity. The loss sustained by this club, the medical profession of Chicago, the two millions of inhabitants of this city, its educational and charitable institutions, and, more especially, its suffering classes, rich and poor, by the premature death of our late President, cannot be computed. His whole professional career has been characterized by an unselfish devotion to his calling. For thirty-seven years he was permitted to practise his profession, for which he possessed an inborn natural aptitude, which he loved so dearly, and for the advancement of which he made many valuable original contributions. By hard and unselfish work he won for himself an enviable position in his profession, and the esteem, respect, and love of his large *clientèle* — a convincing proof that

"The secret of success lies in the man, and not in the stuff he works on." — Bradford Torrey.

Sooner than he expected, his life was cut short by untimely death, and he now rests after an arduous life, spent in the interest of suffering humanity, the advancement of the science and art of medicine and surgery, in the quiet, peaceful bosom of Mother Earth, in Calvary Cemetery.

We shall henceforth miss his genial smile, his noble example, his words of wisdom and encouragement. The eye that penetrated the mystery of disease and fathomed the depths of the human heart has been dimmed by death, and the hand that wielded the scalpel with confidence and unerring accuracy is forever at rest. The lips that uttered words of cheer, hope, and comfort in the sick-room are silenced, never to speak again. We, his nearest and dearest friends, have sustained a loss in his death, which Time, the healer of most of human woes, cannot repair.

We shall miss our departed friend at our meetings. We shall miss him in our daily routine of professional work. Dr. Fernand Henrotin is dead, but he has left us a heritage of greater value than gold or precious stones; the example of a noble life well spent, as

"He was a good man, and a just." — Timothy xxiii, 50.

And

"The greatest good that any man can do is to inspire a love for the higher life in the mind of another."

We can learn many valuable lessons from the life of the departed, a few of which I desire to emphasize in this brief, commemorative sketch, which we should strive to emulate.

Dr. Fernand Henrotin was born in December, 1847, in Brussels, Belgium, and died in Chicago, Sunday, December 9, 1906. At the age of ten years he came to Chicago with his parents, and received a high school education here, and graduated from Rush Medical College with the class of 1869.

As his father was a physician of note, he imbibed a taste for the medical profession from early childhood, which only increased with his entrance into active practice. Even as a tender youth, he assisted his father in his surgical practice, which was undoubtedly the means of creating in him a predilection for the art of surgery. He began his professional career with a high school education, and what knowledge of medicine he could obtain in Rush Medical College at that time, in two or three years, six months' terms. Endowed with a splendid physique, a fertile, well-balanced brain — the greatest of all inheritances — and in possession of a reading and speaking knowledge of the three most important modern languages — English, French, and German — he at once began his post-graduate education by the study of home and foreign medical literature, and thus kept pace with the wonderful advancements which have characterized the last three decenniums of the history of medicine. His desire for additional knowledge increased with the new discoveries and progress of the science and art of medicine and surgery. His inborn aptitude for the profession of his choice dictated to him, at an early period of his career, the advisability of not remaining for any length of time a mere borrower of the new developments, but, instead, of joining the ranks of the scientific men who were then engaged in the work of making medicine and surgery what they are destined to be: exact sciences.

Dr. Henrotin began his professional career under the most favorable auspices. Chicago, in population, did not then exceed three hundred and fifty thousand inhabitants. His father enjoyed a lucrative practice, and after his death, young Henrotin became his natural successor; and in this way came at once in touch with some of the best families in the rapidly growing city. His pleasing personality, his diligence, his tender devotion to the sick, gained for him at once a large general practice. As a general practitioner he had no equal in Chicago.

In the sick-chamber, in the lying-in room, at the bedside of the infant, face to face with a grave emergency, in the operating-room, he was equally at home, giving to his patients, under all and the most varying circumstances, the best that modern medicine and surgery could offer. His very presence in the sick-room brought relief and hope; his gentle eyes beaming with kindness, his genial smile, his kind words of encouragement, his sympathetic actions, made him at once the trusted, beloved physician of the household, to whom young and old looked with equal confidence when disabled by disease or accident. He was imbued with a deep sense of duty toward his patients, rich and poor. He seldom left his post of duty for any length of time. He felt no need for long vacations. He was never too tired to answer a sick-call, whether it was to the mansions of the rich or to the hovels of the poor. The rigor of winter, the heat of summer, the darkness of night, blizzards and rain-storms, had no terrors for him when called upon to relieve a sufferer. He was blind to his own comfort and necessary rest when a sick-call came to him. During the last few weeks of his life he repeatedly came to St. Joseph's Hospital at midnight, spent the remainder of the night sitting in a chair, as he could neither lie down nor sleep, operated early in the morning, and then resumed his daily arduous routine work. About two weeks before his death, he came to the hospital late in the night, never closed his eyes, was panting for breath, and, early in the morning, performed three laparotomies. This was his last operative work, as next day he called, visited his patients, and bade the Sisters good by, and returned to his home with the conviction that his mission on earth was ended.

"He who can at all times sacrifice pleasure to duty approaches sublimity." — LAVATER.

Henrotin's idea of duty was sublime. His whole life is an inspiring illustration of the ever-true saying:

"'T is nobleness to serve. Help those who cannot help again." — EMERSON.

I know of no more pathetic scene than a doctor afflicted with a mortal disease, and near the margin of his grave, exhausting his last resources of strength in performing operations on his suffering fellow-men, in a last determined effort to save life and mitigate suffering. Such acts of heroism surpass anything witnessed on the battle-field. Henrotin did this, and thousands of like medical heroes have done the same before. He was honest

toward himself, toward his patients, toward his colleagues and profession, and

"No legacy is so rich as honesty."

Social distinction and wealth had no charms for him. The height of his ambition was to serve the sick, to add his liberal share toward the progress and improvements of the healing art, to elevate the status of the medical profession to a higher plane. Dr. Henrotin was a man of courage and conviction. His attitude toward his patients and his colleagues was open and frank. His thoughts were not veiled by sentimentality and policy. In private conversation and on the floor of debate, he expressed his opinions forcibly. His courage was undaunted in the face of the greatest obstacles and difficulties. His indomitable courage never left him. He subscribed to and followed the dictum,

"Know that 'impossible' has no place in the brave man's dictionary." — CARLYLE.

One of the most charming features of Henrotin's personality was his good nature, which dominated his intercourse with men under the most trying circumstances;

"That inexhaustible good nature which is the most precious gift of heaven, spreading itself like oil over the troubled sea of thought, and keeping the mind smooth and equable in the roughest weather." — IRVING.

He never spoke ill of his colleagues. He encouraged the young practitioners by word and deed, and in illness and distress of any kind came willingly to the relief of his colleagues near and far, whenever his counsel was solicited. The crowning virtues of the life and work of Henrotin were, however, his benevolence and charity. He had no conception of the value of money when called upon for his professional services or for financial aid; the former were always willingly rendered, regardless of pecuniary reward, and the latter was never refused as long as he had a dollar in his pocket.

He was fully impressed with the idea that

"The most delicate, the most sensible of all pleasures consists in promoting the pleasures of others." — LA BRUYÈRE.

His whole life was an exemplification of the truth that

"Charity, taken in its largest extent, is nothing else but the sincere love of God and our neighbors." — WAKE.

And that

"A beneficent person is like a fountain watering the earth and spreading fertility; it is therefore more delightful and honorable to give than to receive." — EPICURUS.

Earnest, studious, diligent, and persevering, our first President has pointed out the way to a useful and happy life by the practice of universal charity, and that anything we may do,

"Christian graces and virtues they cannot be, unless fed, invigorated, and animated by universal charity." — ATTERBURY.

And that

"Though I have all faith, so that I could remove mountains, and have not charity, I am nothing." — 1 Corinthians xiii, 2.

In public life and in scientific endeavors, Henrotin always took an active interest. From 1868 to 1870 he was prosector at Rush Medical College, surgeon of the Police Department fifteen years, and during this time edited and published a booklet on First Aid, and for twenty-one years was the physician of the Fire Department. For some time he was interested in the National Guard of Illinois, and filled the position of Chief Surgeon of the First Brigade. He was one of the founders of the Association of the Military Surgeons of Illinois, and never lost sight of the interests of military medical affairs in this state. He served for many years on the medical staff of Cook County Hospital, and at the time of his death was president of the Medical Board. It was through his energetic efforts, seconded and supported by Mr. Brundage, that the medical attendance of this hospital has been raised to its present standard of efficiency and brought under the jurisdiction of civil service reform. He was senior surgeon of the Alexian Brothers Hospital and consulting gynecologist of St. Joseph's and German Hospitals. He was one of the founders of the Chicago Policlinic, and served from its beginning to the time of his death as professor of gynecology. He succeeded Dr. Truman W. Miller as president of this institution. His most enduring monument is the new modern hospital in connection with this institution, now nearing completion. He was a member of the American Medical Society, International Gynecological Congress, State Medical Society, Chicago Gynecological Society, American Gynecological Society, and Chicago Medical Society. As president of the Chicago Medical Society he exerted all his energies to bring this society to a wider sphere of usefulness, and more than trebled its membership.

He was ex-president of the Chicago Gynecological Society, State Medical Society, and, as such, added an impulse to these societies for an increased scope of usefulness. Dr. Henrotin was a gynecologist of international repute, but never relinquished his hold on general practice and general surgery.

He was equally at home in the sick-room and in the operating amphitheater of general surgeons and gynecologists. His special leaning was, however, to operative gynecology, and all of his scientific literary productions pertain to this branch of surgery. In whatever field of surgery he was engaged, his every movement demonstrated that he was a real surgeon; a man who had

"A heart to conceive, a head to contrive, and a hand to execute." — GIBBON.

He was the first one in America to perform vaginal hysterectomy for suppurative pelvic disease. If he had any hobbies, they were vaginal drainage and vaginal hysterectomy for malignant and myomatous disease of the uterus.

In this department of pelvic surgery he was a master. His literary work was hampered by a very large and exacting practice. He contributed to medical literature many valuable and practical monographs on pelvic drainage and vaginal operations. Many of these articles were written in the dead of night, when less enthusiastic colleagues were asleep. His chapter on ectopic gestation in *Practice of Obstetrics*, by American authors, and his article on gynecology in the *International Text-book of Surgery*, deserve special attention.

On his deathbed he practically completed the chapter on vaginal hysterectomy for Kelly and Noble's *Gynecology*.

Dr. Henrotin was an ardent advocate of higher standards of medical education, and more especially interested in post-graduate work. He published a booklet about two years ago, *Democracy of Education in Medicine*, which is replete with many practical suggestions on this important subject.

His wife survives him. The universal esteem in which the deceased was held became apparent at the funeral services, which were held in the Holy Name Cathedral and were attended by nearly two thousand mourners, among them several hundred physicians.

Death to an ambitious, useful man always comes too soon. To Dr. Henrotin it came prematurely, and his most bitter regret was that he had to leave so much undone. His intention was to retire to his beautiful suburban home in the course of a few years, and then to devote the remainder of his life to the enjoyments of simple nature, to the writing of a novel of social life, of which he had seen so much, good and bad, and to write a work on pelvic surgery. He was a devoted student and admirer of nature, and longed for

"The calmest and serenest hours of life, where the passions of nature are all silent, and the mind enjoys its most perfect composure." — Dr. I. Watts.

We, his friends, must strive to accomplish what time and death prevented him from doing. He did all that his strength and limitation of time permitted, and he

"Who in life's battle firm doth stand
Shall bear hope's tender blossoms into the silent land."
Von Salis.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

SURGICAL PUBLISHING CO. OF CHICAGO
103 STATE STREET - - - - CHICAGO

SUBSCRIPTION PRICE, FIVE DOLLARS PER ANNUM IN ADVANCE

Managing Editor - FRANKLIN H. MARTIN, M. D.
Associate Editor - ALLEN B. KANAVEL, M. D.

JANUARY, 1907

THE WERTHEIM MEETING

One of the most important and interesting surgical meetings ever held in Chicago was the joint meeting of the Chicago Gynecological and Chicago Medical Societies on October 10, 1906.

Professor Wertheim of Vienna gave to the societies the benefit of his experience in the radical abdominal operation in carcinoma of the cervix uteri, in a carefully prepared paper written for the occasion. The paper was discussed by Dr. John G. Clark of Philadelphia, Dr. Thomas S. Cullen of Baltimore, and Dr. X. O. Werder of Pittsburg, who came to Chicago for the express purpose of discussing this important subject under such auspicious circumstances. The discussion was also participated in by Drs. Ries, Henrotin, Kolischer, and Dudley of Chicago.

Professor Wertheim's important paper with the complete discussions are published elsewhere in this number.

It may be of interest to our readers to know that Professor Wertheim was invited to this country by the editors of this journal, and was the guest of SURGERY, GYNECOLOGY AND OBSTETRICS while in Chicago.

THE OPERATIVE TREATMENT OF CANCER OF THE UTERUS

Those who had the opportunity of hearing Wertheim's paper on the operative treatment of cancer of the uterus, delivered before the joint meeting of the Chicago Medical and Gynecological Societies, must have been amazed at the excellent results obtained by this well-known Austrian surgeon. When we remember that only two or three decades ago cancer of the cervix was looked upon as an absolutely incurable disease, the results of Wertheim, as shown in the paper here referred to, are more than gratifying.

One is frequently prone to doubt the accuracy of statistics, especially when such wonderful results have been reported. It has been our good fortune to know Wertheim for nearly thirteen years, and all his writings have shown the same careful, judicious, and unbiased consideration as that noted in this paper. Furthermore, he has been particularly fortunate in living in a city and country where the police regulations are such that he is always able with little inconvenience to locate any of his old patients. In this country, and particularly in the West and Middle West, the populace is so nomadically inclined that it is often impossible to keep track of our old operative cases, and thus valuable post-operative *data* are lost.

All surgeons agree that the dangers of infection during the abdominal operations for cancer are, from the character of the disease, naturally great, and it is most comforting to

know that Wertheim has been able to reduce the operative mortality in his last one hundred cases to eight. This still seems high, but when we remember that the abdominal route enables the operator to remove the uterus in fifty per cent of the cases, instead of in only twenty-five per cent, as by the vaginal route, as has been clearly shown by Wertheim, then the immediate mortality of the abdominal operation is relatively low.

Recently, Wertheim has added two very valuable changes in the technique. By applying five or six of his long, slightly curved clamps to the parametrium on either side, he is able to remove the lateral adipose tissue almost to the pelvic wall, and, by introducing a suture at either vaginal angle just before applying the large transverse vaginal forceps, is able to check the otherwise troublesome oozing from the vaginal veins.

We were rather surprised at the pessimistic view held by several of our own countrymen who took part in the discussion. An operation which gives such excellent results in the hands of Wertheim, and which has been so enthusiastically employed by Zweifel, Krönig, von Rosthorn, Döderlein, and others, must certainly have its good qualities. We have, in America, many men who are just as dexterous, and whose technique is equally as good as that found on the Continent, and there is no reason why we cannot in a short time show just as good results as those obtained by our friends in Austria and Germany.

In conclusion, we must not fail to mention the very valuable methods of procedure as independently carried out by von Rosthorn of Heidelberg and by Mackenrodt of Berlin. The methods of each of these operators differ considerably from Wertheim's, and yet the operators accomplish practically the same purpose and are getting excellent results.

THOMAS S. CULLEN.

THE SURGICAL ASPECTS OF GASTRIC CARCINOMA[1]

From twenty-five to forty per cent of all cancers in the body are primary in the stomach. Bryant, quoted by Van Valzah and Nisbet, shows that in Baltimore there are two hundred deaths annually from cancer; in Boston, three hundred; in Philadelphia, nearly five hundred; in New York City, nearly nine hundred. Of these, perhaps almost half are directly due to cancer of the stomach.

Medical measures are powerless to cure cancer in any region of the body. Medical measures may, however, in inoperable tumors, sometimes prolong life and mitigate suffering. But, as Bland Sutton said a number of years ago, so long as we are ignorant of the cause of cancer, so long must the only successful treatment be the extirpation of the growth.

If it were possible to prevent cancer, what then? Before answering the question, it would be necessary to determine the cause of cancer. That it is caused by some form of micro-organismal life, it seems safe to infer, but beyond this the most enthusiastic pathologists will not go. We do know many of the predisposing causes of cancer, and especially well recognized are the predisposing causes of gastric cancer.

Chronic gastric dyspepsia is the chief predisposing cause of cancer of the stomach.

Cancer of the stomach presents, clinically, two forms. In one, a patient past middle life, without having suffered previously from indigestion, suddenly loses appetite, especially for meats, grows progressively weaker, more emaciated, develops epigastric pain, possibly a palpable mass, becomes subject to vomiting spells, vomiting a mass of foul-smelling and fermented coffee-ground material, and quickly develops cancerous cachexia. This is the

[1] Based on a paper read before the Southern Surgical and Gynecological Society, at Baltimore, December 10, 1906.

classical picture of gastric carcinoma. It is rare when compared with that other course of development which we have only begun to appreciate in the last few years. The second and much larger class is composed of patients who have been lifelong sufferers from dyspepsia. There are usually no very definite symptoms, patient having been treated for chronic gastritis.

Patients who present symptoms of gastric indigestion, which will not yield in a few weeks to medical treatment, should be subjected to operation.

It is a well-recognized fact that about ninety-five per cent of patients who survive operation for benign disease remain well permanently. May we not conclude that by timely resort to the operation of gastro-enterostomy many patients have been saved from the development of gastric carcinoma?

END-RESULTS AFTER GASTRO-ENTEROSTOMY FOR BENIGN DISEASE OF STOMACH

Operator	Cases Traced	Permanently Cured
Barling	7	7, or 100%
Mayo	28	27, or 96.4%
Moynihan	29	29, or 100%
Czerny	53	44, or 83%
Robson and Moynihan	20	20, or 100%
Paterson (collective statistics)	116	109, or 93.9%
Deaver	30	30, or 100%
Robson	96	89, or 92.7%

The cure of carcinoma, when it has once developed, demands excision of the growth with the infected glands. The immediate mortality of partial gastrectomy is still high, though the death-rate has been reduced very much within the last few years.

The total number of gastrectomies done by the Mayos to date has been 558, divided into two groups — the loop and the no-loop operations. In the loop operations, the mortality was 4½ per cent. These have been abandoned, except in rare cases. The no-loop operation has been done 192 times, with two deaths. Their mortality for partial gastrectomy has been 11.45 per cent; in my hands it is 11.11 per cent, while my mortality for gastro-enterostomy has been 2½ per cent.

Moynihan, basing his conclusions largely upon the statistics of Krönlein and Mikulicz, shows that patients suffering with gastric carcinoma have, under medical treatment, an expectation of life of about twelve months from the beginning of the disease. To compare with this, we have Moynihan's studies of the average duration of life of patients who underwent gastrectomy in the clinics of Krönlein and Mikulicz, which was, from the beginning to the end of the disease, as much as twenty-four to twenty-six months — more than twice as long as the average duration of life without operation.

A question of importance in regard to the surgery of gastric carcinoma is as to the advisability of excision of ulcers, or doing a pylorectomy or a partial gastrectomy in the presence of benign disease as a preventive of malignant change. There are certain added risks, which, in the present state of surgery, are unavoidable, but which must be obviated before the conscientious surgeon can recommend partial gastrectomy in preference to gastro-enterostomy in patients with beginning gastric disease.

The arguments advanced in favor of excision of the ulcer or of the ulcer-bearing area do not, in my opinion, outweigh the arguments against this treatment. Though I firmly believe that the chief predisposing cause of gastric carcinoma is long-continued dyspepsia due to ulcer or other form of benign gastric disease, I do not altogether credit the reports which would make us believe that about one out of every ten ulcer cases is already cancerous.

Pylorectomy quickly fell into disrepute owing to its enormous mortality, although its original

advocate, Rydygier, had the satisfaction of reporting his first patients as alive and well twenty-five years after the operation. But, in the last few years, excision of the ulcer or of the pyloric region has again become popular with some surgeons, chiefly as a prophylactic against the development of carcinoma. Yet it seems to me that a diagnosis of "carcinomatous degeneration" based on microscopical findings as to whose interpretation pathologists themselves are not unanimous, is at least as liable to be in error as is a clinical diagnosis of malignant disease based on the naked-eye appearances of a pyloric tumor found at operation.

Until operation is more frequently undertaken in the very early stages of gastric carcinoma, gastro-enterostomy must still be the operation most often adopted. It has been rare in my experience for a patient, in whom cancer has been certainly diagnosed before operation, to present conditions admitting of gastrectomy. A palpable tumor felt before operation will naturally suggest cancer, yet these tumors have been known to disappear after a gastro-enterostomy; therefore all palpable tumors are not carcinomatous in their nature, and it is in this class of patients that exploratory laparotomy finds its most legitimate field.

Total gastrectomy must remain, I think, an operation of the utmost rarity. Personally, I do not approve it. Subtotal gastrectomy is, in my opinion, as extensive an operation as it is wise to adopt.

Adhesions, I think, are a more formidable objection to radical removal than size of the tumor or lymphatic involvement, especially when the adhesions involve the pancreas.

For the restoration of the gastro-intestinal canal after gastrectomy I much prefer the usual posterior retrocolic gastro-enterostomy to either of Billroth's methods, or to Kocher's operation of lateral implantation of the duodenum into the posterior gastric wall.

When the carcinoma has progressed very far, so that not even gastrojejunostomy can be done, the operation of jejunostomy will relieve suffering, and may prolong life.

In conclusion, I may sum up the consideration of this address subject in the following manner:

1. By timely operation for the various causes of persistent indigestion, many a patient will be saved from developing gastric carcinoma.

2. Early diagnosis of gastric carcinoma being so extremely difficult, and radical removal being only highly promising when an early diagnosis has been made, partial gastrectomy should be an operation limited to cases of malignant disease operated on for symptoms of pyloric obstruction or other gastric affection supposedly benign, in which the existence of cancer, though perhaps suspected, cannot be certainly diagnosed before operation.

3. Partial gastrectomy is the preferable treatment for these cases. In cases moderately far advanced, gastro-enterostomy should be preferred.

4. Where the indication is to prevent starvation, jejunostomy is to be performed.

JOHN B. DEAVER, M. D.

TRANSACTIONS OF SOCIETIES

JOINT MEETING OF CHICAGO GYNECOLOGICAL AND CHICAGO MEDICAL SOCIETIES

RUDOLPH W. HOLMES, M.D., EDITOR OF THE SOCIETY

Meeting held October 10, 1906, the President, DR. FRANK ANDREWS, in the chair.

PROF. E. WERTHEIM of Vienna, Austria, read a paper on THE RADICAL ABDOMINAL OPERATION IN CARCINOMA OF THE CERVIX UTERI. (See paper, *ante*, p. 1.)

The reading of the paper was followed by a discussion by Dr. Thomas Stevens Cullen, Dr. X. O. Werder, Dr. John A. Clark, Dr. Nicholas Senn, Dr. Fernand Henrotin, Dr. Emil Ries, Dr. Gustav Kolischer, Dr. E. C. Dudley, with closing remarks by Professor Wertheim.

DR. THOMAS S. CULLEN

BALTIMORE, MARYLAND

The admirable results of Professor Wertheim's labors demonstrate clearly what may be accomplished by the careful surgeon who is not only a good diagnostician and operator, but at the same time a skilled pathologist also. He operates on a few cases as surgeon and then views the specimens removed from the standpoint of the laboratory man. Valuable points are gleaned which enable him so to alter his operation that more attention is devoted to certain details and less to minor ones. After comparing his surgical and laboratory findings in a large series of cases, he is able to formulate definitely the best plan of action in a given surgical affection. No better example of the necessity of the surgeon's being a well-versed pathologist could be found than in this very paper, and no more striking example of the brilliant results that may be obtained by such a combination.

Two of the most striking findings of Professor Wertheim's are that in 22.5 per cent of the cases, even though the parametrium was soft, cancer was present, and that in 14 per cent of all cases where the parametrium showed considerable infiltration, no cancer was present. This clearly demonstrates that the operator cannot determine at operation, or even on gross examination of the specimen, whether the cancer is widespread or not, and must await the histological findings.

The fact that Wertheim found all cancerous lymph-glands enlarged is also a valuable hint to operators, as, where no enlargement is detected, it will not, as a rule, be necessary to remove them. He also found many enlarged glands that were not involved. This has also been our experience, the enlargement being due to inflammatory changes or to the absorption of necrotic products from the sloughing cancerous growth.

Since 1896 I have seen only one vaginal hysterectomy for cancer, and, personally, have never employed the vaginal route in removal of these growths. As far back as 1893, Professor Kelly was using the ureteral bougies to outline the ureters and prevent their injury during the abdominal operation for cancer. In 1895, Clark, seeing the admirable results obtained by Professor Halsted in his extensive operations for cancer of the breast, decided to apply the same principle in treatment of uterine cancer. He accordingly removed as much of the parametrial tissue as possible, and systematically dissected out enlarged pelvic lymph-glands.

After the publication of Professor Wertheim's operation, this method was adopted by us, and has, with, at times, some slight modifications, been carried out ever since then. As mentioned by Professor Wertheim, Sampson, in our clinic, made careful study of the blood-supply of the ureter, and indicated the best means of shielding the ureter from injury during operation. My own work at that time consisted chiefly in ferreting out the early gross and histological changes that would enable one to make a positive diagnosis of cancer, and thus allow the operator to remove completely the malignant growth in its incipiency.

Our material has been very small when compared with that of Professor Wertheim. Cancer of the uterus, like that of other organs, does seem to flourish more in some localities than in others. Only recently Professor von Rosthorn told us how prevalent cancer was at some university clinics, and what a dearth was noted at others. While visiting my friend Krönig in Freiburg in May, we were discussing the same subject. He told me that while in Jena he would often see two

or three cases a week, but that in Freiburg very few had come under his observation.

One point in the technique has been mentioned, that, in this country, seems to have been overlooked. Dr. Noble of Philadelphia called my attention to it a few days ago. It is this, that the troublesome bleeding from the parametrium may be totally overcome by the temporary application of four or five curved artery-forceps before it is severed, the forceps being later replaced by ligatures. This hemorrhage from the outer angles has been a stumbling-block to numerous operators, and has at times necessitated the abandonment of the operation. It seems to me that the key-note of the success in the reduction of Professor Wertheim's mortality is the increased rapidity with which he removes the uterus. The majority of us have frequently noted a patient doing splendidly for a certain time, then suddenly collapsing, succumbing immediately after the operation, or lingering a few days without ever having reacted.

Professor Wertheim, at the International Congress in Rome in 1902, advocated nephrectomy in those cases where very troublesome ureteral fistulæ developed. I hardly think that we on this side of the water would remove the kidney until uretero-ureteral or ureterovesical anastamosis had been attempted, or until the method that yielded good success in Dr. Kelly's hands in an obstinate ureterovaginal fistula, namely, the turning of the portion of the vagina containing the fistula into the bladder, had been attempted.

I can fully corroborate what Professor Wertheim says concerning the enthusiasm of Professors Döderlein, Zweifel, Krönig, von Rosthorn, and others relative to his operation. Professor Zweifel told me that he had done over two hundred Wertheim operations, and that in the month of March alone, of this year, he had performed fifteen cancer operations according to this method.

I can assure Professor Wertheim that there are many advocates of the abdominal method in this country, and that they will perform a vaginal operation only on exceedingly stout individuals, where the abdominal operation is almost out of the question, and where the isolation of the ureters in a bed of thick friable fat is almost impossible.

The principle of Wertheim's operation is also very valuable in cancer of the rectum low down, where it is necessary to remove the structures extensively. Once having the uterus out of the way and the ureters in view, the growth can sometimes be easily drawn down through the sphincter and removed, the sphincter not being destroyed. The open vagina serves admirably for drainage. I have employed this method in several cases.

Wertheim, assisted by his associates, has done more than any other school to give us a clear idea of cancer of the uterus and to establish a satisfactory cure. He has undertaken an extensive histological study of the subject, involving the perusal of over fifty thousand slides. He has greatly simplified the technique of the operation, and has given us very satisfactory clamps to minimize the danger of infection, and through his careful and rapid work has reduced the mortality to eight per cent in his last one hundred cases, but, best of all, he has increased the number of operable cases to fully fifty per cent of those coming for aid, and has finally done such thorough operations that regional returns are unknown, and sixty per cent of his cases are well after five years. Such work not only meets with the hearty recognition of his American confrères, but calls forth their warmest praise and admiration.

It behooves us as general practitioners and surgeons to examine carefully at once every case where uterine hemorrhage exists, and not to temporize. If there are any suspicious signs, appropriate means of diagnosis should be adopted immediately, and if cancer is present, hysterectomy should be performed at once. A few years of careful tutelage of our patients, and they will realize fully the great danger of delay when such signs are present, and, on the other hand, the bright chances of recovery if early operation be performed.

DR. X. O. WERDER
PITTSBURG, PENNSYLVANIA

The paper of Professor Wertheim has been of exceedingly great interest to me, both because the cancer problem with its many perplexing and unsolved questions is at present uppermost in the minds of all modern gynecologists, and because there is no one in this wide world more able and competent, by means of his immense experience and deep and careful study, to discuss it than Professor Wertheim. The paper presented here to-night is full of interest to me individually for another reason, which is, that I have had the honor of doing a little work along the same lines so successfully marked out by Professor Wertheim. In the *American Journal of Obstetrics* of March, 1898, I described an operation under the title, "A New Operation for the Radical Treatment of Cancer of the Uterus, Consisting in the Removal of the Uterus and Vagina en Masse by the Suprapubic Method," which was first successfully performed by the writer on January 5th of the same year. The technique of the operation is practically the same as that described two years later by

Professor Wertheim in the *Archiv für Gynäkologie*, only with the difference that I made no attempt to remove the regional glands. The failure to do sufficiently radical work in the ordinary vaginal hysterectomy, as demonstrated by the almost uniform recurrence of the disease in the vaginal cicatrix, induced the writer to adopt this procedure for the purpose of enabling him to remove the uterus with a larger amount of parametrium and with the upper part of the vagina surrounding the malignant neoplasm. In this manner not only a more thorough extirpation of all diseased tissue became possible, but cancer implantation could be avoided with absolute certainty. This operative technique was carried out by the reader, with some minor modifications, for five years; i.e., until three years ago. My reasons for giving up a procedure which was undoubtedly correct in theory, and which in practice proved so superior in its percentage of permanent cures to the old vaginal hysterectomy, was its very high primary mortality, which seemed more than an offset to any actual gain in cures. I abandoned this procedure at that time for an operation which might be termed igni-extirpation, which promised equally good results without the great risk attending the former operation. Of this, however, I will speak a little later.

Professor Wertheim emphasizes the great importance of the removal of the parametria, and the great advantage which his technique affords for this purpose. That the extensive removal of the parametria is a necessary requirement in any operation for carcinoma of the cervix must be admitted by every surgeon when he considers that twenty-two per cent of parametria that seemed perfectly sound clinically proved cancerous in Professor Wertheim's material. In this he is abundantly confirmed by other operators, establishing beyond question the unreliability of clinical evidence in regard to the condition of the parametria. Any operation for carcinoma of the cervix must therefore take this fact into serious account. Whether a vaginal hysterectomy can accomplish this satisfactorily seems to be seriously doubted by Professor Wertheim, and unless a more extensive operation than that ordinarily performed is done, we must concede its inadequacy for this purpose. Most of the adherents of vaginal hysterectomy have, however, extended its technique so as to get freer access to the pelvic organs, thus permitting more radical work than was formerly done. The Schuchardt incision, for instance, is one of the means adopted to accomplish this end. A vaginal hysterectomy answering these modern requirements is sometimes quite as difficult as the suprapubic method, if not more so, but its primary mortality has always remained lower than that obtained by the followers of Wertheim. If we take the average mortality of the Wertheim operation as 21.5 per cent, as given by Gellhorn ("Sacrovaginal or Abdominal Operations in Carcinoma of the Uterus?" — *American Journal of Obstetrics*, July, 1905), that of vaginal hysterectomy would be less than one third. That the percentage of cures has been steadily improving under this method of treatment cannot be denied when we compare the latest figures of such men as Olshausen, Zweifel, and others, who have had from 35½ to 39 per cent of cures after five years. These, of course, are far below those presented by Professor Wertheim to-night, which are unquestionably the best thus far obtained. If this operation proved equally as successful in all hands, there would scarcely be any choice left, and we should be in duty bound to adopt it as the best and only one for the cure of this disease. But few other operators have as yet succeeded in reducing their primary mortality much below twenty per cent, and the cures reported are yet so few, outside of those given by Professor Wertheim, that we are not in a position to reach a final conclusion as to the value of this operation. Rosthorn, a very radical follower of Wertheim, had only twenty-two per cent of cures of five years' standing in the cases operated on in Graz (Schindler: "Statistische und Anatomische Ergebnisse bei der Freund-Wertheimischen Radicaloperation des Uterus Karzinom," *Monatschrift für Geburtshülfe und Gynäkologie*). That the Wertheim operation will always, even in the hands of expert operators, give a high primary mortality, can easily be understood when we consider the technical difficulties of the operation and the length of time usually required for its performance in a class of patients generally greatly debilitated, anæmic, and often more or less septic; many of them most naturally succumb to the shock of an operation of such gravity, in spite of every effort on the part of the surgeon. This accounts for the so-called heart-deaths to which Professor Wertheim refers.

The routine removal of the regional glands which Professor Wertheim still advocates in spite of his candid admission that most of his cases of glandular involvement recurred, is a question that can only be solved after many years of patient investigation and a careful comparison of large numbers of operated cases. That the general opinion among operators does not seem favorable to the routine extirpation of the lymphatic glands is best illustrated by the fact that of the original and most enthusiastic advocates of this procedure, Ries is to-day the only one, at least in this country, as far as I know, who consistently practises it. Clark looks

upon the removal of glands as important only in determining the prognosis of the patient. Sampson removes them if the patient's condition justifies this additional step of the operation. As it is a technical impossibility to extirpate all the glands which are liable to become involved in this disease, we can scarcely expect to gain much by attempting to remove a part of them, particularly as this step necessarily prolongs the operation and adds considerably to the risk. Even should an occasional patient be saved by the extirpation of a few cancerous glands, it would scarcely compensate for the increased mortality attending it when done as matter of routine. With our present experience in this matter, it seems to me that the interest of our patient is best conserved when we remove the primary focus of the disease as thoroughly and completely as possible without any regard to the regional glands.

When I take the liberty to refer in this connection to an operation for which I have abandoned the one originated by me almost nine years ago, I do so partly because I wish to justify my course of action and partly because I sincerely believe that in it we have a safe and effective means of successfully combating the disease in a large number of cases of carcinoma of the cervix. It is based upon the principles of the well-known Byrne operation of amputation of the cervix by the galvanocautery, but goes much further than that, inasmuch as it removes the entire uterus by the use of the cautery instruments. It is therefore a hysterectomy accomplished by igni-extirpation. Byrne's results are now a matter of history, and many of us have no doubt often wondered how it was possible for him to cure nineteen per cent of his cases by a simple minor operation, without a single death in three hundred and sixty-seven cases. This is still more remarkable when it is known that Byrne recognized no distinction between operable and inoperable cases, as I have been told by some of his colleagues and pupils, operating on practically all cases that came under his care. In his practice, as well as in all his writings, Byrne placed special emphasis on the importance of thorough and repeated cauterizations of all wound surfaces and edges from which the cancerous material has been removed, regarding the black and charred wound cavity as the "best safeguard against a recurrence of the disease." He explains this by saying that "there is hardly any doubt that the development activity of the cancer cells or germs, in certain stages and under certain conditions, may be arrested or permanently destroyed by a degree of heat much below that which would be detrimental if not destructive to normal tissues; he is certain that the thermal agent exerts some modifying influence on pathological processes much beyond and deeper than the surface actually cauterized, hence the importance of repeated applications, so that every spot suspected of contamination may be thoroughly charred." (Byrne: *Transactions of the American Gynecological Society*, 1889, vol. xiv.)

What impressed me as the most remarkable feature of the Byrne operation, especially when compared with all other vaginal operations for cancer of the cervix, and what, more than anything else, induced me to give it a trial was the almost uniform absence of local recurrences. Byrne says (*Transactions of the American Gynecological Society*, 1888, p. 188): "I have never known an instance of relapse in which the disease has returned to the part from which it had originally been excised. I have repeatedly observed the reappearance of the disease in the fundus, ovaries, or some of the adjacent tissues, but I have never known a single instance in which the disease has reappeared on or very close to the cauterized surface from which the cervix had been removed by galvanocautery." The local mechanical effect of the cautery, consisting in directly destroying the cancer-cells, and by producing coagulation and necrosis preventing a direct implantation into the healthy adjacent tissues, seems scarcely a sufficient explanation of the evidently deep destructive action on cancerous tissues not in close contact with the heated instruments. It seems to justify the assumption that some chemical action is produced, some toxines, perhaps, which penetrate the deeper structures, and while not seriously damaging the normal cells, inflict permanent injury on the less resistant cancer-cells.

The operation which I first tried has been subjected to a number of modifications in its technique, but the principal feature — complete igni-extirpation by means of the galvanocautery knife and Downes electrothermic clamps — has always been retained. At first the entire operation was completed through the vagina, assisted often by the Schuchardt incision, but more recently I have adopted a combined operation, beginning in the vagina and completing it by the suprapubic route. The difficulty of protecting the adjacent parts sufficiently, especially the ureters, during the application of Downes heated clamps on the broad ligaments through the vagina, induced me to adopt this change of technique. The operation is preceded by a thorough curettement of the diseased surfaces and cauterization until all oozing is controlled. The cervix is then firmly held by vulsella forceps, and an incision is made entirely around the cervix as far as possible from the affected area by means

of the cautery knife kept at a dull heat to prevent oozing and rendering the wound dry. While making traction upon the cervix, the dissection is carried up carefully between the bladder and uterus, an assistant with a retractor drawing the bladder well away from the hot knife until the peritoneum is reached, which is, however, not opened. Douglas's pouch is opened posteriorly by the same careful dissection, assisted by the index finger, and the lateral vaginal attachments are then burned through. The vaginal wound is now carefully inspected, and wherever the surfaces and edges do not look black and charred, they are gone over again by means of a dome-shaped cautery until they are thoroughly cauterized. The vagina is now lightly packed with gauze and the patient's abdomen prepared for laparotomy.

A free incision is made between the symphysis and umbilicus and the uterus seized with stout vulsellum forceps, after packing off the peritoneal cavity very carefully with pads. The bladder peritoneum is incised from side to side, opening into the cavity previously made by dissecting off the bladder from the uterus through the vagina. A Downes electrothermic clamp is then applied to the right infundibulo-pelvic ligament and round ligament, the surrounding parts carefully protected by the shield and additional pads, and the tissues included in the forceps are then thoroughly cooked until a thin white ribbon is obtained. The clamp is then removed, and the ribbon cut through near its inner edge, and if, after a few moments, no bleeding occurs, dropped. The other side is then treated in exactly the same manner. This brings the operator down to the parametrium. This is seized first on the least affected side in a clamp, after the bladder and ureter on that side have been carefully protected, and is then burned through; the ribbon thus made is then cut through and another portion of the broad ligament and sacro-uterine ligament is burned in the same mannner, freeing one side of the uterus from all its attachments. The opposite parametrium is then burned in exactly the same way. If our technique has been good, not a drop of blood is lost after the preliminary curettement, and the surfaces are all perfectly dry.

The stump of the vagina is now exposed, its cauterized edges inverted downward and approximated with a continuous catgut suture. Next the bladder is brought over the sutured stump of the vagina and its peritoneum stitched to the rectum posteriorly. The broad ligament stumps are carefully covered up with peritoneum on both sides, leaving the field of operation completely covered with peritoneum, just as after a typical panhysterectomy for fibroid tumor. The abdomen is then closed without drainage. The abdominal portion of the operation is practically that of an ordinary panhysterectomy, with only this difference, that the broad ligaments and parametria are clamped and burned, instead of being tied with ligatures. No preliminary dissection of the ureters has thus far been made. For the exposure of the parametrium and the protection of the ureters we have depended on firm traction upon the uterus and sides of the bladder while the clamps are in position. No injury to these has thus far occurred, but in the cases operated exclusively through the vagina there were three ureterovaginal fistulæ as a result of heat necrosis; one of these has since been cured by an implantation into the bladder, and the other two have not as yet applied for a secondary operation.

While not as much parametrium is actually removed by this operation as in the one described by Professor Wertheim, yet we rely to a great extent on the destructive action of the heat and cauterization on the tissues not only in actual contact with the clamp, but also to some distance beyond it.

Of the twenty-seven cases of carcinoma of the cervix thus far treated by this method of igni-extirpation, only one died, about four weeks after operation, from uræmia, as a result of renal disease, from which she is supposed to have suffered for ten years. The operation, no doubt, hastened but did not cause her death. Of the remaining twenty-six, nine cases have been operated on from two years to two years and ten months. In this series there has been, so far, only one recurrence. Seven have been operated on from one to two years, with two recurrences. One of these was very unfavorable from the beginning, on account of our inability to extirpate the far advanced disease completely. The other was not promising, on account of her youth; she was only thirty-one years old. During the last two or three weeks I have either personally examined or have been in communication with every patient or her physician, so that I feel certain that only three recurrences have so far been observed in these twenty-six cases. In only one was this a local one; in the other two, the recidive occurred in the iliac and inguinal glands. While the number of cases presented is, I admit, entirely too small and the time elapsed since operation too recent to justify any definite conclusions as to the value of the procedure described, I regard the results as sufficiently encouraging to continue the work along these lines in the treatment of carcinoma of the cervix, feeling confident that with greater experience and a

more perfected technique the operation of igni-extirpation is not only a safe one, but should prove curative in a large percentage of cases.

In conclusion, I wish to thank both the Chicago Gynecological and the Chicago Medical Society for the great honor they conferred upon me in inviting me to participate in this discussson in the company of such distinguished guests, and before an audience containing some of the brightest lights in our profession. It is an honor that I appreciate very highly, and I shall always remember this evening with much pleasure.

Dr. John G. Clark

Philadelphia

Even with the most perfect basis for a theory, no one can accurately predict its truth until it is established by practical experience as a working law. All operations, in their incipiency, are controlled by this general statement; for any given procedure, no matter how theoretically plausible it may appear, may prove to have decided limitations when fully tested. I am sure all of us who have participated in the invention of the more radical operations for cancer of the uterus have, at least mentally, if not verbally, overshot the mark in our forecasts of their value. No one has been more enthusiastic than myself in the hope that the wide excision of locally involved tissues and the extensive dissection of accessible glandular areas in cancer of the uterus might lead to far better results. With ten years' experience, however, my enthusiasm has been greatly moderated by the results of the radical operation. It has not been the immediate mortality — for this has been minimum — but the high ultimate mortality, which has given rise to a feeling of skepticism as to the value of the extirpation of the iliac glands. Convinced by my experience that the removal of the glands cuts little figure in saving our patients, but that the wide excision of the locally involved tissues is the vital factor, I have abandoned the first and concentrated my energies upon the second. The operation, therefore, as practised by me is limited to the widest possible extirpation of the upper portion of the vagina and the adjacent parametrium. If it is necessary to dissect the ureter out of a bed of carcinomatous tissue or to excise the lower portion of the ureter, I at once abandon the operation, rather than resort to such a difficult and dangerous operation for the very remote hope of saving the patient. Statistics, so far as operation for cancer are concerned, are, at best, confusing, if not actually misleading. Each surgeon is a law unto himself, for no two operate alike, judge cases alike, or follow up the after-histories with equal precision. The old attributes of a skillful surgeon are dexterity, celerity, precision, and good judgment. In many simple operations a surgeon may have almost none of these attributes, and yet be successful. In operations for cancer, however, the absence of any one of these may make a very serious discrepancy in the results of various operators. In cancer, the judgment as to the possible efficacy of any operation is perhaps the most vital of all. In the statistics of some writers, one finds a very high rate of recurrence; in another, a very low one. This, many times, is not due so much to a difference in the actual skill as to the fact that one operates upon almost all cases which come to him, whereas another chooses his cases with the most discriminating care. When the radical operation was first proposed, many surgeons assumed that it held out a greater hope for far advanced cases of cancer, whereas exactly the opposite was the truth, for in these cases the radical operation carries with it a very much larger immediate mortality and is of no greater value than a simpler procedure in alleviating symptoms. With varying forecasts we have all left the ultimate decision as to the value of radical operations to the test of time, and now it has been sufficiently employed by many competent surgeons to furnish an approximate idea as to its efficiency in each individual's hands. Therefore, from the experience of a few men we can draw more accurate conclusions than from a general collective statistical study, with all of its misleading elements of variations. As just stated, with the results of my own experience, which I believe are sustained by other present-day statistics, I do not believe we are justified in prolonging a hysterectomy for cancer by an extensive dissection of the pelvic lymph-glands. Briefly stated, this conclusion is based upon:

1. The absence, as yet, of any known law concerning metastasis. For, as already demonstrated, the glands of the side of greatest local involvement may be free, while the parametrium, or higher glands, of the opposite side may show microscopic foci.

2. The unreliability of the macroscopic appearance of a gland in determining metastasis; for a large, palpable gland may be removed painstakingly from the bifurcation of the iliacs, and prove to be of an inflammatory character only; while an invisible lymph radical or a microscopic gland immediately adjacent may be the lodgment place for cancer-cells.

3. The absence of any law as to what type of case gives metastasis. A very limited local process may show wide glandular metastasis, whereas the

opposite may be true in the extensive local involvement.[1]

4. The peculiar distribution of metastasis, in that occasionally a lower group of glands may escape metastasis, whereas those above are involved. With all of these facts before me, I can no longer conscientiously prolong an operation in the search for pelvic lymph-glands with the certainty of a higher immediate mortality occasioned by it, without a reasonable hope for a decided improvement in ultimate mortality. Unless there is a very appreciable improvement in ultimate mortality, the greater immediate mortality from these extensive operations will more than counterbalance any good that they may accomplish in an occasional case. Notwithstanding my skepticism, however, I am still quite willing, and even sanction the most extensive operation in the hands of any skilled surgeon who is still guided by the hope that he may accomplish better results in this way than those that have hitherto been obtained by other methods. Therefore I watch with the greatest interest every report of such men as Ries, Wertheim, von Rosthorn, Krönig, Mackenrodt, and others who still hope for the benefits to be derived from glandular extirpations. As a pioneer in the advocacy of a radical operation, the natural question arises at once as to whether I have dropped back to the opposite extreme. I may at once answer this negatively, for to this retrogression I am strongly opposed. Upon the wide destruction of the locally involved tissues depends the greatest percentage of surgical cures. In my opinion, a vaginal hysterectomy will not accomplish this as satisfactorily as a high amputation of the cervix and extensive cauterization of the surrounding vaginal wall. Neither procedure, however, insures this local eradication as satisfactorily as the operation now employed by your honored guest, Professor Wertheim. His modification of certain details of the operation originally suggested by Ries, Rumpf, and myself greatly facilitates its rapidity and thoroughness. The clamps which he has invented for closing off the vagina from above are splendid devices, and make a decided improvement over the imbricated method of ligating the vagina, which I formerly employed. I have repeatedly used these instruments, and find that they not only render the operation much easier, but also greatly reduce the time of operation and render it much more aseptic. Therefore, in conclusion, I believe the operation, as practised by Wertheim, with the exception of the wide dissection of the lymph-glands, is the one most to be advised in skilled hands; but for a novice, or a surgeon with limited experience in abdominal surgery, even this is too difficult. In every case where the glands are easily accessible, and no extra time is necessary for their removal, I extirpate one or two for pathologic examination. If they are the seat of metastasis, I look upon the prognosis as hopeless. As already demonstrated beyond question, the cure of cancer in all but a small percentage of cases will not be accomplished by any surgical operation; but at present it is the only means which holds out any hope, and in every feasible case should be resorted to before any other means of treatment. The future, however, must evolve some other therapeutic means than surgical.

In concluding my remarks, I must express my gratitude to Professor Wertheim for his splendid elaboration of this work. No other operator has equaled him in the persistence of his research and the tenacity of purpose in pushing this matter to its ultimate conclusion. I have read his various publications with the greatest interest, and always give the greatest consideration to whatever he may say upon this subject. If there is any truth in the old German adage, "Uebung Macht den Meister," we may without hesitation confer upon Professor Wertheim a master's title.

[1] It has been our hope that these glandular studies, in connection with the microscopic investigation of the type of the local process, might give us some clue as to the cases in which we may expect these peculiar variations. Pfannenstiel believes that he has discovered certain evidences which may be of value in such a prediction. As yet, however, they have not been incorporated in a working law.

Dr. Nicholas Senn
Chicago

The classical paper of Professor Wertheim, commented upon by previous speakers, opens up a very important scientific and practical subject. I congratulate him on his unparalleled results in performing an operation of such magnitude. I assure him that his operative procedure will be received with favor in this country and its scope widened. I doubt if it will ever be accepted as a routine practice. He admits the severity of the procedure; it is one of the most difficult operations a surgeon can undertake, an operation that should be relegated to the expert. As long as an expert like Professor Wertheim has to operate an hour and a half to two hours, with an average mortality of eight to fifteen per cent, such an operation will never be undertaken as a routine practice in this country. His operation deserves the adjective "radical"; it is certainly a radical procedure, but a procedure based upon sound pathological principles.

We are as yet ignorant of the cause and nature of carcinoma. We do not know what it really is. We know something about the way in which car-

cinoma invades the tissues of the lymphatics and the general circulation. Our operative results from carcinoma of any part or organ have greatly improved since we performed the so-called radical operation, which means the removal of every vestige of the carcinomatous tissue. In carcinoma of the uterus limited to the cervix, removal of the cervix alone is radical. If it involves the body of the uterus, it is not radical. So with urethral contamination, the removal of the organ is a radical operation in every sense that the word implies. The weak point of the operation is, that it is one of such great magnitude, attended by great mortality and difficulty in selecting proper cases. I can understand that in carcinoma of the uterus, giving rise to glandular infection, it is the only reasonable operation to perform. But his own statistics show that in twenty-eight per cent of the glandular involvements he had to deal with hyperplastic glands, and the removal of the glands did not give any result. How deceptive urethral infection is I can illustrate by alluding to one case. About five years ago I made what at that time I thought was a radical operation, through the abdomen. There was no recurrence for four years, when the patient complained of a sciatica, which, on careful examination, was traced to a recurrence, not in the immediate vicinity of the former site of operation, but well up in the fossa of the ileum. If I had removed all of the lymphatic glands as described this evening, that patient would not have been exempt from recurrence. As long as the operation, in the hands of the master, has such a large mortality, and as long as we are not in a position to know the character of the lymphatic enlargement, the operation will not be a routine one.

I wish to thank Professor Wertheim and the previous speakers for the masterly manner in which they have presented the subject, and I am sure every word will be duly considered and the scope of the operation increased in this country.

Dr. Fernand Henrotin

Chicago

The removal of the uterus per vaginam for carcinoma of the cervix dates back to the Dark Ages. The operation has saved many lives, even though these be but a small proportion of those seen and operated on.

Discouraged by the frequency of recurrences, modern operators have perfected a theoretically admirable, complicated, abdominal evisceration, which is being presented here to-night by three of its most enthusiastic promoters. I will not take up further time in argument to-night, but as long as I am put down for discussion, will condense my conclusions as follows:

I do not believe in the extensive dissections recommended, because the death-rate is too high, the morbidity excessive; because all the glands and the lymph-vessels can never be completely removed, and if they could, they would be found uninvolved in more than half the cases.

Modern abdominal hysterectomy has about reached the superlativeness of technical perfection. Many of its promoters have begun to realize that the success obtained has been by reason of the thorough removal of the parametria, and not because of the imperfect removal of doubtful glands, at great cost of life, and are beginning to retrench on the unnecessary and excessive severity of their technique, and, strange to say, are getting as good ultimate results and less primary mortality.

Their past labors have not been in vain. The painstaking elaboration of this subject in these past years by Ries, Wertheim, Schauta, Jonnesco, Winter, Russell, Clark, Werder, Sampson, and many others, has almost made the operative indications clear, and another decade of the same industry on an agreed and uniform basis of statistics will put the whole matter on a proper footing. In all fairness, however, I believe that such as are entirely unprejudiced will agree, when their attention is drawn to it properly, that modern vaginal hysterectomy has not had a perfect trial, and, in my opinion, it is the one and only direction in which we may have hopes of increasing our efficiency.

I refer to the modern perfected vaginal hysterectomy by means of the paravaginal incision. The whole subject has been handled in a most masterly way by Gellhorn of St. Louis, in a communication to the American Gynecological Society, which most of you have read. I firmly believe that the future will demonstrate that Dr. Gellhorn has outlined what some day will be acknowledged as the preferable and most successful method for the surgical treatment of many cases of carcinoma of the cervix. As this is simply a discussion of the abdominal method of operating, and not a formal presentation of the Schuchardt operation, I will close with the following, which seem to me pertinent remarks.

The object to be attained to obtain good results in the surgical treatment of cancer of the cervix is the early and complete removal of the uterus with the parametria. If this can be accomplished as completely and perfectly per vaginam as abdominally, the mortality and morbidity will be materially less.

It must be remembered that we must agree upon

a definite basis of statistics, and the Doctor does not seem entirely in accord with Winter's method of classification, which is usually the one accepted; for he says that he does *exclude* such cases as die before the five years, when he has assured himself that the cause of death has no relation to cancer. He should say, when a recorded post-mortem made by competent authority absolutely proves the absence of cancer, otherwise such deaths are counted as recurrences. If statistics are to count, we must establish a definite basis.

Schauta properly takes the ground that when the glands are affected, their complete removal is not possible. There is good reason to believe that by means of the paravaginal section and igni-extirpation as good permanent results will be obtainable in the near future as by the method presented here to-night. Up to this time, however, nothing is proven, and we can congratulate our honored guest that in his work outlined here to-night he stands pre-eminent at present, and that the world owes him a debt of gratitude. His immediate mortality results are simply wonderful, and testify to his great skill and the high grade of his clinical surroundings.

Dr. Emil Ries

Chicago

I was exceedingly glad to have Professor Wertheim give us a paper, because it gave me an opportunity for renewing an old acquaintance, and because this paper could be expected to bring prominently before this body a subject to which perhaps not sufficient attention has been paid here. Carcinoma of the uterus is a very vital question in European countries, particularly Germany and Austria, where the number of cases is great. In this country, as probably all operators will agree, we see fewer cases of carcinoma of the uterus than they do in Germany. During the four years I was assistant in European hospitals I saw something like two hundred cases of carcinoma of the cervix, while I have not seen two hundred cases of carcinoma of the cervix in ten years in Chicago. But to the unfortunate sufferers from carcinoma the treatment is a most vital question, whether we have a hundred or a thousand cases.

On this question of the treatment of carcinoma of the cervix, I stand to-day where I stood eleven years ago. The operation which I proposed then is an extremely difficult and hard one, and I do not know that I am sorry that it has not become a routine operation, because if it had, in the hands of the average operator the mortality would be very high. It is high enough as it is. If the mortality is reduced from twenty-five to thirty per cent, as it was in the beginning, to six or eight per cent as some operators report it to-day, it is not because the technique of the operation has been perfected; it is not because the operators have become so much more expert: it is only because they have deviated from the path I have laid out in the beginning. The evidence of this the operators give in their own statements. If an operator cuts through the broad ligaments, ligates them off, dissects out the ureter, takes out the uterus, cutting it off from the vagina, and then proceeds to pick out one, two, three, or even five glands because they are large, that is not a radical operation, and is not an operation according to surgical principles. The operation as I had intended it, and as I carry it out to-day, with the perseverance which my material enables me to exhibit, is built up entirely on the knowledge we possess of the nature of carcinoma and of the routes along which it propagates. We all know that if a carcinoma has spread from the original focus to the surrounding tissues, including the lymphatics, it can do so only in two possible ways: one of continuity, viz., a continuous layer of carcinoma extending between the original site and the secondary location, or by transportation along some current (lymph or blood). There is no way of telling macroscopically, without the use of the microscope, where carcinoma ends and where it begins. Now, if carcinoma is liable to be found at a certain distance from the primary focus, as, for instance, the regionary lymphatics, it is a mistake to operate between that distant point and the primary focus, because you never know whether you cut through the carcinoma or not. The question of the glands each one has to determine according to his own pathological knowledge and conscience. A man may say, those forty or sixty per cent that have carcinoma of the glands I will let go as hopeless, because I will not remove the glands. There is some reason in that. A man may look out for his practice, for his reputation, if he looks out for the immediate results. A large number of cases will recover temporarily, if he does not do that very extensive operation. But what about the forty or sixty per cent of carcinoma in the glands? Do we know that that neoplasm will not go on? or do we not rather know that, as a rule, it will go on growing and spreading? Has not our friend from Vienna given us a most excellent reason for not using his way of operating? He says, "I take out only the glands that are changed; those that are unchanged I will not remove." He says, practically, "I can tell what is carcinoma of the glands by looking at them with the naked eye." He leaves the glands which he thus diagnoses as normal. But he says about

recurrences, that they are never local — always in the glands. Does that support the claim that he can recognize carcinoma of the glands macroscopically? Can recurrence take place in the glands unless carcinoma is in the glands at the time of operating? No. The glands themselves can never form carcinoma; they normally have no epithelial cells. If there is carcinoma in the glands months or years after operation, it must have been there at the time of operation and have been overlooked. There is no other way. In a number of cases I have operated on, I have removed the glands as carefully as I could, and examined them, and have found cancerous glands in sixty per cent.

We owe Professor Wertheim a great debt for the very careful examination of the broad ligaments which has been carried out in his laboratory. But the operation on and subsequent examination of the glands, as he carries them out, I regret to say, I cannot accept as being scientifically sufficient. I have looked up Professor Wertheim's own paper in which he states the number of glands removed, and you will find records where he removed two glands, three glands, one gland, and then he says that a systematic removal of glands was made with a systematic examination of series of sections. That is not systematic, because there are certainly more than one, three, four, or five glands in the pelvis. Statistics based on these insufficient data are not reliable. I have a copy of the first paper of Professor Wertheim in which he states that 130 serial sections were made of four to five glands removed. In another case 430 serial sections of over five glands were made, etc. I do not know how that was done, for I often have more than four hundred serial sections to one gland. But, at any rate, as far as these examinations go, they tend to sustain theoretically the advisability of removing all the glands. Professor Wertheim advocates the removal of a more limited number of glands than does Rosthorn. This extirpation of the glands has been the principal moot point in this whole question. If I want to do a hysterectomy, dissect out the ureter, and take off the broad ligaments, I, too, can do that operation in an hour. That is not a severe operation; and the mortality after such an operation is naturally slight. But if I go farther, and extirpate glands thoroughly, I have a much more difficult, a more bloody operation, much more dissection of the connective tissue. I begin my operation differently from Professor Wertheim. I separate the peritoneum, and begin with the dissection of the glands and surrounding tissue, as we do in dissection of the axilla in carcinoma of the breast. Some of my patients were doomed before I got through the dissection. In my first operation, ten years ago, I took three hours; now I have reduced the time to two hours. I have had deaths from the heart, such as those Professor Wertheim speaks of, also, and I have had deaths in trying to dissect off large cancerous glands from the vein, a tear in the vein, and severe hemorrhage therefrom, causing the patient to succumb on the table, or soon after the operation. Those are the dangers.

I have to say that my remote results are fully as good as Professor Wertheim's, and my observations reach farther back than his. I operated more than five years ago on eight cases, and two died from the operation. Six survived. Six are living to-day. I could easily figure out a hundred per cent. The oldest case operated on came back more than nine years afterwards for an enlargement of the inguinal glands as big as a fist, which proved to be carcinoma. Why does carcinoma remain quiescent for ten years and then suddenly begin to grow? Why do we not hear so much of recurrence ten years after vaginal resection? Simply because the cases of vaginal hysterectomy die from local reccurrence before they have had time to develop the glandular recurrence. We see more and more of the glandular recurrence of which Dr. Senn spoke, when we do a radical operation, because one little gland left behind is likely to resume growth after years.

With all the danger connected with this operation, all the severe work it means, I beg of you to remember that carcinoma always kills; the operation does not; it may kill, but the operation gives the patient a chance to recover completely, not only a respite of a few months before recurrence. I see cases of carcinoma that drag out a miserable morphine-numbed existence after incomplete operations. I cannot see that it is a greater loss if the patient dies of the operation, rather than of the protracted misery of the carcinoma. I shall strive with all my might and main to acquire such an absolutely perfect technique and dexterity that I can cut down the time of operation another and yet another ten minutes until I can do it in an hour and a half. I do not know that it can ever be done in less time, for it is a much more extensive operation than the amputation of a breast with dissection of the axilla, with which it is so often compared. In the operation for the breast it is usually one side which needs the dissection; in the operation for the uterus the dissection must always be done on both sides.

But the hope of the cancer patient lies in the perfection of technique, perfection of asepsis, not in the restriction of the extent of the operation.

DR. GUSTAV KOLISCHER
CHICAGO

The value of the abdominal operation for cancer of the portio or of the cervix uteri cannot be decided upon by general remarks, whether they be personal or objective, but only in this way, that we consider its definite or remote results and compare those with the results of the other operative methods. But this comparison has to be carried out after the principle that Dr. Henrotin mentioned; that is, we have to use a common basis for judging upon the statistics. This basis was first given by Winter, and then somewhat modified, and, as quite competent authors claim, improved upon by Waldstein. But it is not only necessary to mention this basis; we have to stick to it in drawing conclusions.

For instance, statistics simply enumerating results of vaginal hysterectomy without differentiating between cancer of the portio and cancer of the intermediate part of the cervix will necessarily prove to be fallacious.

If we do not consider the change in the percentage of operability produced by the use of the abdominal method, we create another source of error.

It is, furthermore, necessary to distinguish between the primary mortality of those times when the technique of the abdominal operations was not so fully developed as it is now, and between the primary mortality of the later series of cases. Then we shall find that the total mortality of the two routes does not materially differ.

As to the igni-extirpation, I would call attention to the fact that the inventor of this operation, Mackenrodt, after having operated on a great number of cases in this way, abandoned this practice and developed an abdominal operation, which he now exclusively uses in cases of cervical cancer.

It is not very sound surgical judgment to expect better remote results, because in using an active cautery we sear little farther into the tissue, in which local relapses will occur. Why not do, then, the radical thing, and extirpate this whole tissue, which procedure is made possible by the adominal route? Will any surgeon relinquish the ablation of the fascia or the removal of one or both pectorales muscles in operating for mammary cancer, and simply amputate the mammary gland with a Paquelin?

Now comes another point, that was first mentioned by Dr. Ries in his early publications on this subject, and since then repeatedly accentuated by him. It is only possible to remove the parametric tissue in its entirety if we dissect out and lay bare the pelvic part of the ureters. To any man familiar with the anatomy of the female pelvis, this is an indisputable fact. And now we should close our eyes to this fact and just burn around a little in the parametric tissue, without dissecting out the ureters.

We cannot overlook the fact that in his latest statistics Professor Wertheim does not report one single case of local recurrence after having performed his abdominal operation. And the local recurrences are the most frequent ones after vaginal hysterectomies — so frequent, that their appearance leads to the fallacious theory of implantation of cancer germs during the operation.

As to Schuchardt's operation, after what I have seen in Europe and after my own experience, I am rather doubtful whether this operation is not just as formidable a surgical injury, if you permit this expression, as the abdominal operation. Furthermore, Schuchardt himself reported only forty per cent of permanent results, while Wertheim recounts sixty per cent permanent results, concluding from the same time limit.

It seems that the greatest danger of the abdominal operation is produced by the hunting for and by the enucleation of the lymphatic glands. Now there are some clinicians and pathologists who admit the possibility that cancerous germs may be taken care of by the glands, provided the local tumor is thoroughly eradicated.

I would like to report one case that illustrates a practical point in the question of removal of the glands. At the time that Kraske's operation for removal of cancerous uteri was practised in Vienna, a woman, who previously had lost one kidney, was operated upon for cervical cancer by the sacral route. Two years and a half after this, the patient died from an embolism of the remaining renal artery. The post-mortem did not show any local recurrence, but imbedded in the mighty cicatricial tissue high up in the pelvis, there were cancerous lymph-glands. These glands must have carried their cancerous glands at the time the uterus was removed, but, surrounded by the thick cicatricial tissue, they slumbered there for years, and did not cause any clinical symptoms.

It has to be considered whether it will not be possible to reduce further the primary mortality of the abdominal operation by improving upon the methods of anæsthesia and by abolishing any extensive hunt for glands.

The argument that this operation will never be an operation of surgical routine, because only few men are competent to do it, is not a strong one.

If there were only one man in America, and only one man in Europe, able to perform the operation successfully, that is, that never has a local recurrence, and a total of sixty per cent

definite cures, the operation as such would still stand. If so and so many men were incompetent to perform the operation, that would not condemn the method; it would condemn only their surgical training.

Dr. E. C. Dudley

Chicago

My observation of the radical operation, as set forth by Professor Wertheim, is yet too small to warrant me in speaking very positively on the subject. The papers to which we have listened have impressed me very strongly. It looks as if we shall be obliged to modify our ideas of surgical treatment of carcinoma of the cervix uteri. There can be no question of the increased freedom from recurrence by the radical operation. Of course, if other operators are able to approximate the low immediate mortality of Professor Wertheim (eight per cent), and the large percentage of non-recurrences (sixty per cent), the radical operation will have to be the recognized procedure. It is possible that even Professor Wertheim will not be able to do this in another series of cases. It is interesting to have the best authority for the statement that the advantages of the removal of all the glands are not sufficient to offset the increased danger of that most hazardous procedure. We owe Professor Wertheim a great debt for the work he has done in this and in other fields, and I wish personally to acknowledge my own obligations to him. I should like to challenge the statement made by one or two speakers, that the vaginal operation is nearly or quite as dangerous as the radical abdominal operation. Indeed, it is well known that many operators can show, over a large series of cases of vaginal hysterectomy, little or no mortality whatever; in fact, there is no reason why vaginal hysterectomy should have any considerable mortality. I myself have made vaginal hysterectomy about two hundred times, and, with one or two exceptions, every one of these cases has resulted in recovery from the operation. I have lost two or three cases in which the uterus was so large and fixed that it was necessary to make an abdominal incision in addition to the vaginal operation. I am quite unable to give definite secondary results in all of these cases, for the reason that I have not been able to follow the cases. The difficulty of keeping track of surgical results in this country is much greater than it is in Europe. However, I can think offhand of ten or fifteen cases which have remained well for six or more years. Perhaps some advocates of the radical operation are inclined to let their zeal run away with them to the extent of looking sharply for recurrences after the vaginal operation, and, on the contrary, looking indifferently for such results after the abdominal operation. The same zeal might lead an enthusiast to a one-sided interpretation of statistics.

I have wounded the ureter in only one case of vaginal hysterectomy. The operation was for carcinoma of a senile uterus in a woman of about seventy years of age. In this case I immediately made a vesicovaginal fistula, punctured the bladder-wall at a point near the cut ureter by means of a long blunt forceps from within the bladder outward, seized the approximate cut end of the ureter with these forceps, drew it into the bladder, split it, denuded the bladder mucosa, and stitched the split ends down upon the denuded surfaces, one to each side of the punctured wound in the bladder. Subsequent cystoscopic examination and ureteral catheterization revealed a healthy condition of the injured ureter. This case was reported before the Chicago Surgical Society nearly three years ago, and published in the *Annals of Surgery*. The danger of wounding the ureter in the ordinary operation of vaginal hysterectomy for carcinoma is small.

I am much impressed with the operation of igni-hysterectomy for cancer of the uterus, as set forth by Dr. X. O. Werder of Pittsburg. This procedure is surely safer than the more radical operations, and unquestionably gives a promise of greater freedom from recurrence than could be expected from ordinary vaginal hysterectomy. It may prove to be a compromise between vaginal hysterectomy on the one hand and the more dangerous radical operations on the other. The statement which one critic has just made, that it is unscientific, should be ruled out of the discussion. Even the unscientific procedure should be elected in preference to the scientific procedure, if it saves more lives; but I deny the allegation. Igni-hysterectomy is not unscientific, although it is unscientific to attempt to condemn it by an epithet.

Dr. Wertheim (*closing*)

Never before have I regretted so much that I am unable to master the English language. If I were able, it would be easy enough to refute all the exceptions that were taken to-night to my paper.

However, because I easily could foresee that I would not be in a position quickly and decisively to answer in the course of discussion, I took particular pains carefully to elaborate my paper.

Practically, I could reduce my closing word to referring again to my paper by requesting my opponents to read it rather carefully after it appeared in print.

There are only two points, however, I would like to dwell on.

Ries inquiries how I could explain relapses originating in the lymphatic glands if, as I stated, I never found cancer in glands that were neither enlarged nor hardened. Ries questions, in this remark, the reliability of my histologic examinations of the lymphatic glands, which researches, however, are generally recognized. The answer to that is very simple. It is possible that some regionary lymphatic glands already carry the first germs of carcinomatous degeneration, although the microscope fails to reveal them, in spite of most careful examination of cuts in series. Certainly — and Ries is quite right in this statement, which, by the way, is an old issue — it would be correct from a theoretical standpoint to remove in each and every case all the lymphatic glands. That, however, is an ideal postulate, that to execute is impossible.

A complete removal of all the lymphatics and of all the lymphatic glands is, first, a technical impossibility, and even if it could be carried out, it would imply such a prolongation of the operation and such a denuding of blood-vessels, nerves, and so on, that these conditions necessarily would lead to very serious sequelæ.

In this question the issue is, not to insist on principles, but to find the happy medium between theoretical demands and practical possibilities. That, of course, is impossible to achieve with insufficient clinical material. Finally, I do not think it is necessary for me to answer such questions. The 345 cases which I reported to-night suffice for decisive answers in all directions. If anybody does not feel satisfied with the fact that I succeeded in operating in such a way that sixty per cent of my patients remained free from relapse after five years' observation, then all I can do is to request him to do better than I did. His material, of course, should be sufficiently numerous and his research work just as reliable as mine.

The other point I want to discuss relates to the primary danger and mortality.

You all certainly will remember that in the beginning the abdominal hysterotomy for fibroids also produced a rather high morality. To-day this operation is generally practised with good results, and no one doubts that it has come to stay.

I am confident the same will happen with the amplified abdominal operation for uterine cancer; that much can be gleaned from scrutinizing my material and my results. If I succeeded in lowering the mortality to a satisfactory level, it may be assumed that others will accomplish the same result.

If you peruse the reports of Zweifel, Döderlein, Krönig, Franqué, Kleinhaus, and others, you will find that these authors also report the same satisfactory low mortality.

SOCIETY OF CLINICAL SURGERY

Seventh meeting of the Society, held at Philadelphia, October 26–27, 1906.

On Friday, October 26th, the members assembled in the Pennsylvania Hospital amphitheater.

The surgeons of the hospital staff, with the co-operation of their assistants, showed a large number of cases and performed a variety of operations. Dr. R. H. Harte operated for cystic goiter and a large pelvic tumor. Dr. R. G. Le Conte operated for diffuse peritonitis arising from an acutely inflamed appendix, and performed supravaginal hysterectomy for myoma uteri. Dr. J. H. Gibbon operated for inguinal hernia, and performed a secondary operation for cystic ureter due to stone impacted in the ureter. Dr. J. P. Hutchinson operated for ovarian cyst, and did an emergency operation for perforating gastric ulcer which was found to be well walled off. An interesting feature of these operations was that three operators performed at the same time in the surgical amphitheater. In addition to these operations, Dr. Harte showed a case of Banti's disease in a young man on whom he had operated twice — once by gastro-enterostomy for melena and once by splenectomy; the patient appeared well and vigorous after two years. Dr. Harte showed also the excellent result of a hip-joint amputation. Dr. Le Conte showed cases illustrating: 1. Gumma of the liver simulating bile-passage disease; 2. Papillomatous cyst of the breast, well after six years; 3. Two cases of acute perforating gastric ulcer; 4. A case of adenomatous exophthalmic goiter, well after one year; 5. Two cases of stab-wound of the pericardium cured by operation; 6. A case of amputation of the thigh for thrombotic gangrene (in a child twenty-eight days old); 7. A successful case of intussusception; and 8. Suggested a course of treatment for a certain

form of appendiceal abscess. Dr. Gibbon spoke of the extraperitoneal and intraperitoneal operation for stone in the ureter, and showed a case of recovery from stab wound of the heart, operated upon. Dr. Hutchinson showed: 1. A case illustrating osteomyelitis of the humerus, with great loss of bone, cured, with a useful arm; 2. An extensive crush of the skull; 3. Traumatic rupture of the intestines, resembling ulcer; 4. Gunshot wounds of the stomach and intestines and kidney — a case in which half of a round worm was found free in the peritoneal cavity. Dr. W. Estell Lee (by invitation) of the house staff spoke of methods of anæsthesia employed in this hospital, especially the preliminary use of ethyl chloride. Dr. W. T. Longcope (by invitation) spoke of Hodgkin's disease, its nature, and operations therefor, and showed a large number of interesting specimens. Dr. F. T. Stewart (by invitation) showed cases illustrating: 1. Suture of the heart, and 2. Thoracic aneurysm, well two years after operation, gold wire insertion into the sac, with faradism. Dr. Stewart then operated by this method upon a patient, the victim of large aneurysm of the aortic arch. Dr. G. C. Robinson (by invitation) demonstrated a number of specimens illustrating cystic kidney and hydronephrosis. Dr. J. Allison Scott (by invitation) then offered a number of interesting observations on the surgical treatment of typhoid perforation and hemorrhage.

At 12:45 P.M. the Society assembled in the Anatomical Laboratory of the Jefferson Medical College, where Dr. J. C. Da Costa demonstrated on the cadaver a method of securing by gauze-suspension the movable kidney. Dr. W. W. Keen (by invitation) then met the members in the old amphitheater of the hospital, and showed a large number of interesting cases and specimens: 1. Skiagraphs illustrating atheromatous arteries in the arm; 2. The specimen of a tumor of the carotid gland; 3. A child from whom he had removed an unusual sacrococcygeal tumor; 4. A man the victim of a remarkable burn of the head when a child, by which the bones of the calvarium were lost; 5. A patient from whom he had removed a fibroid tumor of the cerebrum nineteen years ago; 6. A specimen (X-ray) illustrating fracture of the anatomical neck of the humerus; 7. The X-ray of a fractured cervical rib; 8. The specimen and the patient two years after operation, illustrating an enormous mixed tumor of the neck; 9. A patient with no pulse in either wrist, without obvious cause; 10. X-ray of a malformed first rib; 11. Two cases of fracture of the humerus involving the musculospiral nerve, and spoke of a case of a woman the subject of vesico-vagino-rectal fistula, which was closed by occluding the vagina and turning the bladder into the rectum, which thus became a cloaca for the mixed excreta. This operation was done thirty years ago, and the woman has maintained good health.

Members were then driven in automobiles to the German Hospital, and at 2:30 P.M., in the surgical amphitheater, Dr. J. B. Deaver (by invitation) performed the following operations: 1. Supravaginal hysterectomy for myoma; 2. Ileocolostomy for tumor of the cæcum; 3. Appendectomy, by the McBurney method, for chronic appendicitis.

On Saturday, October 27th, at 9 A. M., the members gathered in the surgical amphitheater of the University Hospital, where Dr. Frazier and Dr. Davis held a clinic. Dr. Frazier showed: 1. A case of spasmodic torticollis relieved after division of the spinal accessory and the cervical roots; 2. A young man upon whom he had operated by decompression for tumor of the cerebrum; 3. A case illustrating admirably cure of popliteal aneurysm by the Matas method; 4. A case operated upon for endothelioma of the cerebellum; 5. A case of operation for femoral aneurysm in an old syphilitic patient, operated upon by the Matas method about two weeks ago, with resulting gangrene of the foot; 6. A man exhibiting an extensive necrosis of the skull from an electric burn; 7. A rarely interesting case of pylorectomy, with the specimen, operated upon for pyloric cancer implanted upon an old ulcer; 8. A case of craniotomy for obscure cerebellar disease, the patient appearing well several weeks after decompression. Dr. Frazier then operated upon a case of Jacksonian epilepsy, making a large bone-flap over the left motor area and exposing a deeply injected pia. He used his dental engine osteotome. Dr. Davis then showed: 1. A skiagraph illustrating intracapsular fracture of the hip, and discussed his method of operating; 2, 3. Two cases of knee-joint ankylosis successfully treated by the so-called Murphy method; 4, 5. Cases illustrating the successful use of tendon transplantation in the foot. Dr. Davis then operated upon a child for congenital dislocation of the hip, first reducing the dislocation, then cutting down upon and deepening the acetabulum. Dr. Martin showed a rubber fish-tailed drainage-tube for common-duct drainage, and Dr. J. H. Jopson (by invitation) exhibited a patient operated upon by gastrostomy twelve years ago for impassable œsophageal stricture. At 11 o'clock, in the Anna Dike Scott amphitheater of the Maternity Pavilion, Dr. W. R. Nicholson (by invitation) and Dr. J. S. Evans (by invitation) demonstrated their method of taking intrauterine cultures.

At 11:30 A.M. the members proceeded to the laboratory of pathology, physiology, and pharmacology, where Dr. J. E. Sweet (by invitation) demonstrated experimental operations on the heart; Dr. A. J. Smith (by invitation) illustrated with specimens theoretical considerations of the ætiology of intussusception; Dr. G. P. Muller (by invitation) spoke of methods of instruction in surgical pathology and his experimental studies in the use of silk in tenoplasty; Dr. W. T. Cummins (by invitation) demonstrated the experimental production of arteriosclerosis with adrenalin, and Dr. Leo Loeb (by invitation) spoke of his experimental studies in the transmission of tumors.

The members then proceeded to the amphitheater, where Dr. H. S. Wieder (by invitation) illustrated with an interesting series of lantern-slides the process of bone regeneration after fractures, and Professor Conklin of the biological department (by invitation) illustrated with lantern-slides the principles of the organ-forming substance of the egg.

At 1 P.M. the members lunched in the Laboratory Building.

At 2 P.M., in the surgical amphitheater, Dr. Edward Martin showed: 1. Cases illustrating the use of silver bone-splints in the open treatment of fractures of the long bones; 2. A case operated upon nine months previously by suture of the external popliteal nerve, with partial restoration of function; 3. A variety of drainage-tubes; 4. A suction-catheter for the detection of vesical calculi; and 5. Operated upon a child with an extensive tuberculous peritonitis.

At 3 P.M., in the Wistar Institute of Anatomy, Dr. R. Tait McKenzie (by invitation) gave an interesting demonstration of his method of clay-modeling in teaching the development of the brain; and Prof. A. B. Donaldson spoke of his experiments in the effects of castration upon the growth curve in rats.

The Society then adjourned, to meet in Buffalo and Cleveland in April, 1907.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M.D. — E. WYLLYS ANDREWS, M.D.
FREDERIC A. BESLEY, M.D. — WM. R. CUBBINS, M.D.

VOLVULUS OF THE SMALL INTESTINE IN TYPHOID FEVER SIMULATING PERFORATION. By John B. Roberts, M. D.

Dr. John B. Roberts reports a case in which the ileum was found kinked and straightened out, with recovery. It was almost impossible to differentiate from perforation. He cites two other cases, very similar, which were reported by Dr. Allen Eustis of New Orleans. — *Annals of Surgery*, July, 1906. WM. R. CUBBINS.

CAPILLARITY IN INTESTINAL SUTURES. By F. Gregory Connell, M. D.

Dr. Connell used all the different materials that are commonly used for sutures in bowel-work, and tested them as to their capillarity, viz., dry, wet, after boiling in plain water and after boiling in soda water. With these he found that a simple perpendicular twisted silk had the most marked power, while the others, viz., plaited silk, linen, and Pagenstecher, were about the same, except when the test was made dry. Here the Pagenstecher did not show any capillarity, which was also true of Bartlett catgut.

Knots showed marked interference. A tight thread also interfered more than a loose thread, a large thread had more capillarity than a small thread, and a thread in contact with a flat surface more active capillarity than one free. But when placed in the bowel the walls of the organ seem to be so firm around the suture that the threads are not able to exert any capillarity such as would cause a colored solution of methylene blue to show in the peritoneal surface, even after it had been exposed for two hours, after which time the sutures are covered with a plastic exudate. Under this test all sutures acted the same in from periods of fifteen minutes to two hours in the live animal, with the condition as nearly normal as possible. Therefore the author concluded that there is really very little danger from capillarity, either from over-and-over sutures or a continuous Cushing suture. — *Jour. Amer. Med. Assoc.*, July 11, 1906.

WM. R. CUBBINS.

RESULTS OF THE BITERMINAL TRANSPLANTATION OF VEINS. By Alexis Carrell and C. C. Guthrie.

The authors report the biterminal transplantation of veins between the cut ends of an artery, with the following results: 1. The wall of the artery is only slightly altered. 2. The wall of the vein has become enormously thickened, the muscular and fibrous layers of the middle coat and the inner layer of the outer coat being principally involved. No evidence of the weakening and breaking down of the wall is observed. The ligatures are enveloped in a dense coat of fibrous tissue.

Conclusion. 1. A venous segment interposed between the cut ends of an artery quickly undergoes anatomical changes. 2. From macroscopic and microscopic standpoints, the vein has a strong tendency to assume the character of an artery. From a physiological standpoint it assumes the function of an artery. — *Amer. Jour. of Med. Sciences*, Sept., 1906. WM. R. CUBBINS.

FEMORAL HERNIA. By A. J. Ochsner, M. D.

Dr. Ochsner reports a number of cases of femoral hernia which have remained cured from one to fourteen years by simply dissecting out the sac, and, after ligating high up, removing the excess; then all the fat in the inguinal canal is removed and the skin incision closed. The author believes that the application of sutures, which distort the opening of the femoral canal, tends to favor the recurrence of the hernia, rather than prevent it. Besides, the method he suggests is very simple. — *Jour. Amer. Med. Assoc.*, Sept. 8, 1906. WM. R., CUBBINS.

TUMORS OF THE CAROTID GLAND. By W. W. Keen, M. D., LL. D., and John Funke, M. D.

Dr. Keen reports a case of tumor of the carotid gland which he removed after ligating the common, external, and internal carotid arteries along with the internal jugular vein. The patient died two days after the operation, from œdema of the lungs.

Twenty-six other cases are reported, of the same

character, with the clinical and pathological aspects carefully considered. The tumor has no marked clinical symptoms, and is most frequently recognized by its negativeness; viz., a tumor appears in the neck, at the division of the common carotid, usually about the size of a hen's egg, painless and more or less fixed. There is no tenderness and no local pressure symptoms, or cerebral symptoms due to pressure. Growth is usually slow, but may be rapid, or become rapid after an apparently quiet period.

Owing to the high rate of mortality from the ligation of the common carotid and the disturbance of the function of the vagus, operative interference is not advised, unless the tumor is causing symptoms or growing rapidly.

Dr. Funke reports very carefully upon the histological findings, and classes it among the endotheliomata. He also discusses the origin and anatomy of the gland from both a historical and original research knowledge. It arises from mesodermal tissue near the external carotid artery, and histologically shows a cell-ball formation. It is rich in blood-vessels, and when any tumor formation occurs there is a corresponding increase in the size and number of the blood-vessels. The cells of the tumor and those lining the capillaries have essentially the same character. — *Jour. Amer. Med. Assoc.* WM. R. CUBBINS.

A REVIEW OF FIFTEEN HUNDRED OPERATIONS UPON THE GALL-BLADDER AND BILE-PASSAGES, WITH ESPECIAL REFERENCE TO THE MORTALITY. By William J. Mayo, M. D., Rochester, Minnesota.

The total mortality of these operations was 4.43 per cent, in which everything is considered. In 843 cholecystostomies the mortality was 2.13 per cent; in the last 272 cases the mortality was lowered to 1.47 per cent. This is considered to be the safest operation to be performed on the bile tract.

Cholecystectomy had a mortality of 3.13 per cent, and in the last 500 cases dropped to 1.62 per cent. The indications for this operation are: 1. Those cases where the obstruction of the cystic duct prevents the gall-bladder from taking any part in the biliary circulation. In these cases, even after the obstruction is removed, there is usually trouble from fistulæ or colics, brought about by kinking, which are due to contractures. 2. Thick-walled gall-bladders that have become functionless and are open to a suspicion of malignancy should be excised. The cure of these cases is absolute when the disease is confined to the gall-bladder, but the writer had only one occurrence of stone in the gall-bladder after a cholecystostomy.

Operations on the common duct are divided into three classes of cases: 1. Those patients with stones in the common duct may or may not have jaundice. These cases were comparatively simple, although more severe than the cholecystostomy or cholecystectomy, the mortality being 2.9 per cent, with no recurrences. 2. Stones in the common duct with an active infection of both the common and hepatic ducts associated with a Charcot's liver. These cases were very serious, the mortality being 16 per cent. Recurrence was noted several times, and was probably due to the formation of stone in the hepatic duct after the obstruction of the common duct by the bladder stone. Pancreatitis of a chronic type was noted in these cases.

Complete obstruction of the common duct had a mortality of 34 per cent. In these cases there was little or no bile in the ducts, and the patient's condition was very poor, with severe toxæmia manifest. It is best to operate these cases in the interval between attacks, as they sometimes relieve themselves either with dilatation of the duct or by ulceration into the bowel. The mortality here was 34 per cent. Malignant diseases have a mortality of 33⅓ per cent.

The relation to the pancreas is interesting. Out of the 1,500 cases, 86 times this gland was involved enough to be observed. There were 4 acute cases; of these, 2 recovered and 2 developed a chronic form. — *Annals of Surgery*, Aug., 1906.

WM. R. CUBBINS.

FILIGREE WIRE IN ABDOMINAL HERNIA. By Willard Bartlett, M. D.

After five years of experience with an original filigree intended to prevent and to cure abdominal herniæ, the author reports several cases in which he has used a filigree of silver wire with a double loop formation to cure and prevent herniæ. Some of the cases are five years old, and have had no ill effects from the foreign body, and the herniæ have remained cured. — *Jour. Amer. Med. Assoc.*, Sept. 8, 1906. WM. R. CUBBINS.

ON THE USE OF THE TEMPORAL FASCIA TO COVER IN CRANIAL DEFECTS. By Carl Beck, M. D.

Dr. Beck reports a case of Jacksonian epilepsy due to a skull defect in which temporary relief has been given by filling in the defect with the temporal fascia. An incision is made through the fascia to the bone with convexity downward and dissected up along with the periosteum, leaving the upper part, or base, attached. The peripheral portion is then attached to the dura and the skin closed over the periosteum. — *Annals of Surgery*, Sept., 1906. WM. R. CUBBINS.

SPECIFIC SERUM IN EXOPHTHALMIC GOITER. By John Rogers.

John Rogers has employed a serum made from the thyroid glands of exophthalmic goiter patients.

The serum was made by grinding the glands to a pulp, extracting with normal salt solution and straining off the coarse fibers. The resulting filtrate was then frankly acidified with acetic acid — a heavy precipitate of nucleoproteids resulting. The supernatant liquid was then siphoned off and half-saturated with ammonium sulphate, which carried down the remaining nucleoproteids and the globulins, including thyroglobulin or the supposed active secretion of the gland.

These precipitates were combined, and, after removing the natural salt by dialysis, were, to some extent, injected, while fresh, into rabbits. The major part of the precipitate was dried for preservation. After five weeks of treatment, the rabbits were bled to death, and a serum, designated Serum A was obtained. Serum B was made later from the dried precipitate. Serum C was prepared in a similar manner, but later. Serum D, made from the normal thyroid, has not yet proved to be satisfactory.

Four patients affected with exophthalmic goiter have been treated with Serums A, B, and C, with the result of three apparently perfect cures. Three recovered from a critical condition and are now approaching a cure. The others are more or less improved.

The doses of the serums were five minims, gradually increased to ten or fifteen minims. Swelling and erythema may appear at the site of the injection. The remedy must be used with great care, but seems to be capable of producing some remarkable results. — *Jour. Amer. Med. Assoc.*, 1906, No. 7, p. 487. WM. R. CUBBINS.

MYELOMA. By Dr. T. V. Verebély. From the Budapest Surgical Clinic, Hofrat. Prof. Dr. E. Réczey, Director.

Verebély reports a case of a man 52 years old, who presented a tumor in the middle of the sternum, extending from the third to the fifth ribs, poorly outlined, nodular, painless, not pulsating, the skin being movable over it, but the tumor not being movable upon the underlying structures. Patient was dyspnœic, and a tracheotomy became necessary; death following, after 15 days of exhaustion and dyspnœa.

Autopsy, in addition to the tumor of the sternum, revealed a tumor in the larynx at the level of the cricoid, which so constricted the laryngeal lumen that a small probe could scarcely be forced through. Metastases were also found in the ninth and tenth vertebræ.

Blood findings were normal. The tumor and its metastases in the larynx and spine were diagnosed microscopically as myeloma.

Verebély discusses the subject of myeloma at length, both from the pathological and clinical sides, and he quotes extensively from the literature.

Myeloma is defined as follows: Progressive changes originating in the lymphatic tissue of the bone-marrow, but only when these changes cannot be regarded as simple incidental findings of a constitutional lymphatic tissue disease (such as pernicious anæmia, leukæmia, infectious anæmia, pseudoleukæmia).

The clinical appearances of myeloma he summed up as follows:

I. Symptoms referable to the bony system.

1. Bony deformities, especially the bones of the trunk (vertebræ and sternum), with stiffness difficulty in moving.

2. Spontaneous fractures, especially of the ribs.

3. Demonstrable bony tumor with softening of the bone, giving way to pressure (parchment crackling), often with pulsation (Rustizky). The sternal tumor, which is often the first symptom of the disease, may in many cases be first discovered by the increased sternal dullness.

4. Skiagraphs may show bony defects and bony rarefication.

II. Symptoms referable to the surrounding soft tissues, such as demonstrable tumors.

III. Nervous symptoms. These may be divided into groups.

1. Paralyses of basal origin, often transitory in character.

2. Paraplegia dolorosa (Charcot); more seldom simple paraplegia.

3. Various neuralgias; sciatica or intercostal neuralgia, etc.

4. Absence or weakening of the tendon reflexes.

5. Pains of varying character, for the most part extremely persistent.

IV. General symptoms, which indicate a deep-reaching disturbance of the organism.

1. Blood changes, usually a simple anæmia.

2. Fever, partly following complications, partly as primary symptom of the bone-marrow loss; in the latter case, of an intermittent character.

3. Albumosuria. Bence-Jones reaction is also observed.

The pathological conclusions reached by the author are noted as follows:

1. The primary (myelogenic) tumors of bone-marrow may originate from the connective-tissue

structure, from the endothelial cells, or from the lymphatic tissue.

2. Myeloma is a true form of tumor, and has equal rank with tumors of other forms of tissue (myoma, glioma, etc.).

3. Two divisions are given at present: myelogenous pseudoleukæmia and lymphosarcoma of bone. These names are superfluous and incorrect.

4. Myeloma being considered as a single form of neoplasm, different forms of the neoplasm may be differentiated, which have their explanation in the polymorphous structure of the bone-marrow.

5. The clinical appearances of myeloma may take many forms, and have not as yet been sufficiently worked out.—*Beiträge zur Klinischen Chirurgie*, vol. xlviii, 1906.

W. C. DANFORTH, M. D.

SPLENECTOMY IN TRAUMATIC RUPTURE OF THE SPLEEN. By Walther Hörz. From the Surgical Clinic in Tübingen, Professor von Bruns, Director.

To the statistics of von Berger, published in 1903, which give 69 cases found in the literature up to that time, Hörz adds 103 which he has collected. He rules out cases in which the spleen had undergone pathological changes due to malaria or other disease. Minute details are given concerning a case occurring in the clinic of Professor von Bruns in the summer of 1905.

As to the symptoms of a rupture of the spleen, the following are emphasized:

1. Tenseness of the abdominal wall. This sign has been emphasized by Hartmann and Trendelenburg, but absence of it does not rule out a splenic rupture, as the reported cases of Schönwerth, König, and Neck have indicated.

2. Abdominal dullness is given by Hörz as a characteristic sign, the dullness changing with position. This may also be absent, on account of the fact that a large amount of blood may be contained in the small pelvis and between the intestinal coils, without becoming evident upon percussion.

3. Anæmia, which rapidly increases. Almost always present, except in small capsular tears.

As to the methods of controlling the hemorrhage, the following methods are enumerated:

1. Ligature of the splenic vessels. This is, of course, always followed by necrosis, as animal experiments have shown.

2. Suture of the tear. The capsule only can be sutured, as sutures tear rapidly through the splenic pulp; therefore large tears cannot be treated in this way.

3. Tamponade of the spleen wound. Simple and quick, but not to be relied on in large tears.

4. Splenectomy. Agreed upon by all authors as the safest and most effectual.

Hörz lays great stress upon the removal from the abdomen of all blood-clots, on account of the great ease with which they become infected. The insertion of a drain at the lower angle of the wound for twenty-four hours is recommended.

The post-operative changes are discussed at some length. Many quoted authors seem to agree that the convalescence from splenectomy seemed to resemble in general that from any other laparotomy of equal severity. As to changes of specific organs, the following is said:

1. *Thyroid.* This is reported as enlarged in only four of the cases from the literature.

2. *Bones and Bone Marrow.* In Hörz's own case no bony tenderness to pressure was noted. From the experiences of others, which are quoted, Hörz believes that it rarely occurs. Changes in the bone marrow have been examined in only one of the reported cases, that of Riegner, and showed only lively efforts on the part of the marrow to replace the lost blood.

3. *Changes in Lymphatic Glands.* Glandular swelling was not noted in Hörz's case. Glandular enlargement has been reported 11 times in 62 cases. A few cases, in which a second laparotomy permitted an examination of intra-abdominal glands, showed no enlargement. It is, however, noted that in some cases glandular enlargement comes on late, up to four months after operation.

4. *Blood Changes.* (*a*) Decrease in the number of the red cells and of the hæmoglobin percentage, in consequence of the loss of blood. (*b*) Slight increase of the white cells. (*c*) Approximately normal number of polynuclear leucocytes, considerable increase of lymphocytes and of eosinophiles.

As to the ultimate result of splenectomy, Hörz states that up to now there have been absolutely no unfavorable consequences. The lack of a spleen has in no published case been the cause of death. —*Splenektomie bei traumatischen Milzruptur. Beiträge zur klinischen Chirurgie.*

W. C. DANFORTH.

INFECTION OF THE BILIARY TRACT, WITH SPECIAL REFERENCE TO LATENT (OR MASKED) AND TYPHOID INFECTIONS. By A. O. J. Kelly, M. D.

The article is based upon the statistical study of the clinical and other phenomena of 216 patients operated upon by Dr. John B. Deaver during the last six years.

The author elects to discuss the subject under two divisions: first, the more immediate conse-

quences of biliary infection, and second, the more remote consequences.

The Infectious Agents. A study of the bacteriology of the biliary tract of seventy of the patients operated upon was made. The results are as follows:

	Cases	Per cent
Bacillus coli communis	23	32.8
Bacillus typhosus	7	10.0
Staphylococcus pyogenes aureus	2	2.9
Streptococcus pyogenes	1	1.4
Staphylococcus pyogenes albus	1	1.4
Bacillus coli and staphylococcus aureus.	2	2.9
No bacteria	34	48.6

The Pathways of Infection. 1. The diverticulum of Vater and the common bile duct; 2. The portal circulation; 3. The systemic circulation; 4. The lymphatic circulation; and 5. Directly through the wall of the gall-bladder or the gall-ducts from the peritoneum.

1. Infection from the duodenum by way of the diverticulum of Vater and the common bile duct. The writer states, in this connection, that the possibility of this mode of infection cannot be denied, its probability may be conceded, but the exact factors concerned in its mechanism have not yet been determined definitely.

There are at least two important factors opposing a ready ascending infection of the biliary tract. One, the action of the sphincter of the diverticulum, which has been estimated by Oggi as exerting a force equal to a pressure within the common duct of 700 mm. of water; the second, the influence of the free flow of bile, rather than any antiseptic action of the bile itself. These deductions are drawn relative to this source of infection: 1. That certain ill-understood factors exercise in the process a more or less unknown part; and 2. That in the past we have unquestionably overestimated the importance and the significance of this source of infection.

2. Infection by way of the portal circulation is considered as doubtless a common source of biliary infection.

It is stated that although one may well concede, indeed maintain, that under normal circumstances bacteria carried to the liver by the portal circulation are there destroyed by the bactericidal properties of the liver-cells, yet he must admit a limit to such bactericidal properties, and that, when overcome, bacteria may pass over into the biliary passages.

3. Infection by way of the systemic circulation, although possibly not an exceedingly common source of infection of the biliary tract, should not be entirely ignored.

4. Infection by way of the lymphatic circulation has been suggested by G. P. Müller, who, pointing out its likely mechanism, reports a case that he believes illustrates this manner of infection. I am inclined to agree with him, although this is probably a most infrequent source of infection.

5. Direct infection through the wall of the gall-bladder or of the ducts from the peritoneum has been suggested as a possibility; but, excluding cases of general peritonitis in which the gall-bladder may participate secondarily in the more widespread lesions, and in which the mechanism of the local infection may be quite obvious, it is doubtful if infection of the biliary tract directly from the peritoneum can occur in the absence of adhesions.

Typhoid Infections. The author states that there is comparative unanimity regarding the following points:

1. That the typhoid bacillus is regularly present in the gall-bladder, and commonly in pure culture, in practically all cases of typhoid fever — indeed, it is the one region of the body from which pure culture of the organism is most likely to be obtained; 2. That the typhoid bacillus may persist in the gall-bladder, as well as within gall-stones, weeks, months, even years, after the patient has recovered from an attack of typhoid fever; 3. That cholangitis and cholecystitis (catarrhal, suppurative, and gangrenous) are by no means infrequent complications of typhoid fever; and 4. That a history of antecedent typhoid fever may be obtained in many cholelithitic and cholecystitic subjects.

Relapse in Typhoid Fever. It is pointed out that many so-called relapses are manifestations of some local infection of the body, and in many cases a gall-bladder infection will be found.

Primary Typhoid Cholecystitis. The typhoid bacillus was isolated from the gall-bladder of 7 of Dr. Deaver's 216 patients. A brief report of ten cases is given.

The Gruber-Widal Reaction in Case of Jaundice. Since the earliest days of the clinical use of the Gruber-Widal reaction in the diagnosis of typhoid fever, cases of so-called catarrhal (as well as other forms of) jaundice have been observed in which the serum reaction was positive, whence, at first, it was not unnaturally thought that possibly jaundice vitiated the diagnostic trustworthiness of the serum reaction. However, since we have come to recognize the importance and the frequency of typhoid infection of the biliary tract, since we have learned of the occurrence of a primary typhoid cholecystitis and cholangitis, we have come also to think that these cases of jaundice are examples of typhoid infection, and that the Gruber-Widal

reaction is of much importance in determining the nature of the jaundice (infection). — *The American Journal of Medical Sciences*, Sept., 1906.

F. A. Besley, M. D.

A New Hæmolytic Reaction of the Blood Serum in Malignant Disease, and its Diagnostic Value in Surgery. By George Kelling.

This paper of Kelling's is the sixth one of a series he has written during the past year or so, dealing with hæmolysin and precipitin formation in cancerous subjects. In the body of the paper, Kelling states in detail his method of establishing the existence of hæmolysins, but the method is too detailed and complicated to permit of a short and at the same time an accurate restatement. The basis of the reaction lies in the fact that the blood serum of a patient suffering with carcinoma hæmolyzes the red blood-corpuscles of various lower vertebrates. In his work, Kelling uses the corpuscles of the sheep, calf, chicken, and hog. He explains the hæmolytic action on the basis that carcinoma results from the entrance into the human organism of embryonal cells of some of the lower vertebrates. As these cells develop into carcinomata, the organism attempts to protect itself against them by manufacturing a hæmolysin antagonistic to them.

Kelling states that the hæmolytic reaction is constant, and independent of dietary changes, and it may be obtained from a patient suffering with recurrence or metastasis, as well as from one with only a primary tumor. If a primary tumor be radically removed, and no recurrence take place, the reaction disappears. One can obtain the reaction by injecting embryonal animal cells into a human being. It is possible by this method to diagnose occult, invisible, and impalpable carcinomata, and, more than this, to arrive at entirely new views concerning cancer. The reaction, according to Kelling, entirely invalidates the Cohnheim theory. — *Archiv. f. klin. Chir.*, bd. lxxx, h. 1.

M. G. Seelig.

Tumor of the Carotid Body. By J. Chalmers Da Costa.

Da Costa reports a case of tumor of the carotid body, with ultimate recovery, but with post-operative hemiplegia and hoarseness, the hoarseness being, in all probability, due to injury of the superior laryngeal nerve. The history of the case is narrated in full and the operative difficulties emphasized. As conclusions deduced from this one case, and from the cases reported in the literature, Da Costa states that the operation of removing a tumor of the carotid body is a very formidable one. The surgeon may have to tie all the carotid arteries, and he may damage a nerve or nerves, with the subsequent unfortunate results. The ligation of the common carotid artery is an extremely dangerous procedure, and it is one of the few operations in which the mortality does not seem to have been greatly diminished since the days of Sir Astley Cooper, who in 1808 did the first successful ligation of the common carotid.

The danger of death, however, is not the only danger in ligating the common carotid. The case in question shows that hemiplegia may follow the operation. It has long been known that a considerable percentage of those on whom ligation has been performed suffer subsequently with cerebral symptoms. In some of the cases, these symptoms have been produced by thrombosis; in others, by embolism; and in still others, by cerebral softening. In older subjects, arterial atheroma may interfere with the distention of certain vessels whose integrity is necessary to bring sufficient blood from the vertebrals, from the other internal carotid, and from the terminations of the external carotids. Failure in a satisfactory restoration of circulation is most liable to occur when profuse bleeding lowers the blood-pressure, as it did in this case. When such cerebral change ensues, it does not necessarily mean death. In fact, it may be recovered from, partially or completely. Usually, however, the condition is progressive, and finally results in death. The reported cases show that often all the carotids must be ligated.

Another danger of the operation is nerve-injury. In the author's case, the superior laryngeal was injured. In Funke's fifteen cases, there were six cases in which the nerves were injured — the sympathetic, the pneumogastric, the hypoglossal, the facial, or the recurrent laryngeal. Two cases out of the fifteen exhibited post-operative paralysis of the vocal cord of the side operated upon.

It is thus evident that the operation of removing a carotid tumor is an extremely dangerous one, and is not to be lightly undertaken.

Reclus correctly states that one should not touch these growths, unless they are productive of danger to life. So long as they are merely slowly progressing, they had better be let alone. It is when they begin to grow rapidly that one should remove them, and then he must, in spite of the danger. — *Annals of Surgery*, Sept., 1905. M. G. Seelig.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. Bacon, M. D. — Rudolph W. Holmes, M. D.
C. v. Bachellé, M. D. — Hugo Ehrenfest, M. D.

Internal Podalic Version in Shoulder Presentation. With Especial Consideration of the Prognosis. By L. Demelin.

From 153 cases of shoulder presentation the author eliminates 78 complicated with placenta prævia, and various other pathological conditions which would affect the prognosis, and studies the remaining 75 from the standpoint of the prognosis of the operation. The maternal mortality was 4 per cent.

In 8 cases the fœtus was dead before the operation. Of the remaining 67 cases, the fœtal mortality was 24 per cent.

In 26 cases the membranes were intact. Here the maternal mortality was zero, but two fœtuses were killed during the extraction. The conclusion drawn from the series is, that in case of intact membranes the patient should be put to bed, and all measures tending to excite uterine contractions, like internal examination, dilatation of the cervix, etc., should be avoided until complete dilatation, when internal version should be made.

In 49 cases of version after rupture of the membranes, three mothers died of rupture of the uterus. Of 22 dead fœtuses, 8 died before intervention, and 14 as a result of extraction (34 per cent). These results are not favorable to the practice of rapid extraction of the child with incomplete dilatation. Hence the conclusion that when the membranes are ruptured, if version is not contraindicated, turn at once, or as soon as sufficient manual dilatation can be effected. Abstain, however, from immediate extraction, and wait for complete dilatation before extraction or for spontaneous explusion. — *L'Obstetrique*, Mai, 1906.

C. S. Bacon.

Primary Carcinoma of the Ovary. By A. Louise McIlroy.

A detailed statement of the condition found on microscopic examination of a number of specimens of primary ovarian carcinoma is given in this article. The writer has also made a careful examination of the different forms of malignant change which the ovary may undergo. Fifteen cases, where the question of cancer occurring as a primary growth elsewhere could be eliminated, are reported. The pathologic investigation is described so elaborately as to make impossible an abstract of value, considerable space being devoted to a consideration of the various theories as to the origin of the cells of the membrana granulosa and to the origin of the ovarian cyst. It is therefore sufficient here simply to state the writer's conclusions.

1. *Clinical.* (*a*) Primary carcinoma of the ovary occurs at or near the menopause, although found in three patients between twenty and thirty. (*b*) It has a marked influence on menstruation, tending to cause cessation of the periods. (*c*) Previous pregnancies have little or no influence, the disease being almost as frequent among nulliparous as among multiparous patients. (*d*) Pain is not a marked symptom, patients seeking advice for the relief of the abdominal swelling with its concomitant symptoms. (*e*) Ascites is present in most cases. (*f*) Metastatic growths depend upon the duration of the disease and the integrity of the tumor capsule. (*g*) Recurrence is probable. (*h*) There is often little or nothing to suggest the diagnosis of malignancy. (*i*) The mortality is high.

2. *Pathological.* (*a*) Both ovaries are most frequently affected, one showing a more advanced condition than the other. (*b*) In the early stage the capsule is firm, of fibrous tissue; later, it becomes friable, and the tumor tissue forms surface proliferations. (*c*) The superficial or pseudo-germinal epithelium is not usually found. (*d*) Ova, Graafian follicles, and corpora lutea are, as a rule, not present. (*e*) Evidence of previous pathological but benign changes has been found in most specimens. (*f*) The carcinomatous growth is best found in the thickened portions of the cyst-walls and in the cortex and furrows of the solid forms. (*g*) The epithelial cells are derived from the cells lining the follicles and from the cells derived from the germ epithelium. (*h*) The so-called ova are degenerated masses of protoplasm; they are retrogressive products of the follicle cells which have

undergone pseudo-mucinous and colloid degeneration. (*i*) Karyokinesis is present, but is not a marked feature of these tumors. (*j*) The cells resemble those found in the benign pathological growths, but differ in their distribution and irregular arrangement and in the amount of proliferation. — *Jour. of Obstet. and Gynec. of the Brit. Emp.*, vol. x, p. 331, Oct., 1906. CAREY CULBERTSON.

LABOR COMPLICATED BY ORGANIC DISEASE OF THE HEART. By Percy Ingram and C. N. Longridge.

This paper is a short report of fifty cases from the records of Queen Charlotte's Hospital. The majority of the patients left the hospital on the fourteenth day of the puerperium, after which time their condition is unknown. Only those cases are reported in which attention was attracted to the heart by cardiac symptoms. Of the fifty women, four died; a mortality of eight per cent.

Case 1. Primipara, aged 22. Had shown cardiac symptoms for three years, and compensation was failing on admission. Labor spontaneous in the eighth month, assisted by forceps. Died on the twenty-eighth day. Autopsy showed ulcerative endocarditis and kidney and spleen infarcts.

Case 2. Primipara, aged 24. Three weeks before term, compensation was entirely broken down. Double mitral lesion. Accouchement forcé, forceps, craniotomy. Fifteen ounces of blood lost, and death in forty-five minutes.

Case 3. X-para, aged 43. Previous labors normal. Spontaneous labor at term; short. Compensation broken down, with œdema and bronchitis. Death ten minutes after delivery.

Case 4. VI-para, aged 40. Previous labors normal. Labor in the twenty-eighth week; precipitate. Died on the nineteenth day of the puerperium.

Ten infants were lost, none of which were viable at birth. Twenty of the women had had four or more children. Previous abortions are recorded in but six cases. Premature labor took place in five primiparæ and eleven multiparæ, being brought on in six instances by the introduction of bougies. Thirty-two cases showed a definite history of rheumatic fever or chorea. Of the primiparæ, one had mitral stenosis; eight, mitral regurgitation; eight, double mitral lesions; two, mitral and aortic disease. Of the multiparæ, five had mitral stenosis; thirteen, mitral regurgitation; twelve, double mitral lesions; and one, mitral and aortic lesions. Sixty-eight per cent of the women went through labor unassisted; eleven primiparæ and twenty-three multiparæ. Delivery by forceps was adopted in eight primiparæ and six multiparæ. Labor was induced six times. Craniotomy was performed twice, and once resort was had to dilatation of the cervix with a bag, followed by version and extraction. Twins were born twice, and twice the pelvis was contracted. In two cases, also, the placenta was adherent and was manually removed. — *Jour. of Obstet. and Gynec. of the British Empire*, vol. x, p. 247, Sept., 1906. CAREY CULBERTSON.

MITRAL STENOSIS AND PREGNANCY. By Herbert French and H. T. Hicks.

The obstetric histories of three hundred consecutive cases of mitral stenosis in women over twenty, from the records of Guy's Hospital, have been carefully analyzed by French and Hicks. In this way the writers have covered not only those cases where cardiac symptoms led the patients to seek medical aid, but also those in which pregnancy produced little or no heart failure.

The following general principles regarding valvular heart disease and pregnancy are accepted as well established, with no further discussion: 1. Of all the varieties of chronic valvular heart disease, mitral stenosis is that most commonly accompanied by heart failure during pregnancy. 2. Aortic lesions without mitral stenosis are rare in women; few cases of pregnancy in women who have aortic without mitral disease come under observation. 3. When symptoms of heart failure have preceded pregnancy, they are made worse by pregnancy. 4. Repeated pregnancies at short intervals cause greater risk of heart failure than do few pregnancies at longer intervals.

As regards loss of compensation, there is the greatest difficulty in determining whether women with mitral stenosis, whose cardiac compensation has broken down in relation to child-bearing, have a worse prospect of life than have other patients whose heart failure has been due to other causes. Those who die at home are not heard of again. Those who recover completely for the time being are lost sight of. The proportion who die in the hospital is really no criterion, therefore, and these statistics are given only for what they are worth. (*a*) Of 135 mitral stenosis patients who had borne children, but whose heart failure did not date from child-bearing, 44, or 33 per cent, died in the hospital. (*b*) Of 57 mitral stenosis patients who had borne children, and whose heart failure did date from child-bearing, 20, or 35 per cent, died in the hospital. (*c*) Of 13 mitral stenosis patients, who were married but never pregnant, 6, or 46 per cent, died in the hospital. (*d*) Of 95 mitral stenosis patients, who were unmarried, 17, or 18 per cent, died in the hospital.

Finally, the writers believe that the dangers of

pregnancy in these lesions have been overstated, previous statistics having been based mainly on cases of mitral stenosis which came under observation because heart failure had developed during or soon after pregnancy. Hence all those patients with mitral stenosis who go through pregnancy without developing cardiac symptoms have not been considered. At the same time, it is not denied that pregnancy may cause serious and even fatal cardiac failure in these lesions, nor that heart failure is to be expected sooner or later in almost all cases of valvular heart disease. Their conclusions regarding these patients are: 1. That comparatively few are sterile; 2. That they are not especially liable to abort; 3. That the majority bear children well; 4. That when heart failure develops in relation to pregnancy it is very often not with the first pregnancy, but after several pregnancies; 5. That the treatment should be the same as for a non-pregnant patient with mitral stenosis; 6. That it is not just to negative marriage absolutely in all women with mitral stenosis. The risk should not be minimized, but it should not be exaggerated, and distinction should be made between cases. Whether the woman marry or not, it is likely that she will not reach old age. She should not have successive children rapidly. But, after the age of twenty, with good cardiac compensation, the chance that pregnancy will accelerate the time of heart failure is probably not so great as has been stated in the text-books. — *Jour. of Obstet. and Gynec. of the British Empire*, vol. x, p. 201, Sept., 1906.

CAREY CULBERTSON.

GRAVES'S DISEASE A MANIFESTATION OF AUTO-INTOXICATION OF PREGNANCY. By J. Audebert.

The writer records in detail the case of a woman aged 33, who had always been healthy and free from nervous trouble. Her first pregnancy had been normal, and she was now pregnant for the second time. At the seventh month, with no other symptoms, a slight œdema of the legs was observed. This increased, micturition became less frequent, the total quantity of urine decreased, and the thyroid gland began to enlarge. Improvement for a short time occurred, following a diet of milk, but a trace of albumin became evident at the eighth month. From this time on the symptoms were more pronounced, the urine being markedly decreased in quantity, dyspnœa coming on, and exophthalmos developing. Complete rest and a strict milk diet were unavailing and general anasarca ensued. Purgation was of no material benefit. The lungs showed crepitation, the pulse became rapid and feeble, the pupils dilated, and coma supervened. Between five hundred and six hundred grams of blood were withdrawn, whereupon labor began, and a living child was delivered by forceps. Improvement was evident after three days, though a tremor of the upper limbs persisted and the pulse remained rapid and small. Thyroid treatment seemed to have no influence upon the generally enlarged gland, though the symptoms slowly subsided, until, after four months, all had disappeared.

Audebert states briefly the usual symptoms of hepatic toxæmia of pregnancy, and thinks that occasionally this condition may underlie a typical exophthalmic goiter. He believes that this case was, in all probability, one of autointoxication of pregnancy with secondary symptoms similar to those of Graves's disease, rather than a true exophthalmic goiter occurring acutely in pregnancy. — *Le Syndrome de Basedow Considéré comme Manifestation de l'Auto-intoxication Gravidique. Annales de Gyn. et d'Obstet.*, Sept., 1906, p. 547.

CAREY CULBERTSON.

INVERSION OF THE UTERUS TREATED BY DE RIBES BAG. By Paul Mantel and A. Pinard.

The case is reported of a multipara, aged 26, delivered of her third child by forceps, labor lasting twenty hours. Acute inversion of the uterus ensued, probably due to traction on the cord. The placenta, implanted in the fundus, had become detached, but the membranes were very adherent about its periphery. These were separated, and the uterus was replaced easily. Five days later, during micturition, inversion again occurred spontaneously, without symptoms of collapse or hemorrhage. Manual reposition was this time impossible, and a de Ribes bag was inserted into the vagina. This was removed after forty-eight hours, whereupon it was discovered that the inversion had altogether disappeared. The bag was re-inserted and allowed to remain eight days longer. Recovery was complete. Pinard regards cases of inversion as very rare, having seen but one case in sixty thousand deliveries. He classifies uterine inversions as: (*a*) Immediate, produced during the second or third stage; (*b*) Recent, existing some hours or days later; (*c*) Chronic, weeks or months after labor. By way of treatment, Pinard employs immediate reduction manually in every case where possible, the patient being kept at rest and avoiding all straining. He resorts to the rubber bag only, if the inversion recurs. He does not favor the use of vaginal tampons or of stem pessaries. Where reduction by hand is impossible, especially where sloughing has had time to develop, surgical interference is required. Operation is the only resort in the majority of chronic cases. — *Annals de Gyn. et d'Obstet.*, May, 1906. CAREY CULBERTSON.

VAGINAL HYSTERECTOMY FOR IRREDUCIBLE INVERSION OF THE UTERUS OF PUERPERAL ORIGIN. By J. H. Ferguson.

ABDOMINAL HYSTERECTOMY FOR INVERSION OF THE UTERUS, FATTY DEGENERATION OF THE INVERTED PORTION. By A. H. F. Barbour.

Ferguson's case is that of a primipara, aged 32, who went through a tedious labor, being delivered by forceps; presentation persistent occiput posterior. The placenta was expressed easily after twenty minutes, there being no hemorrhage or discomfort of any kind. The child was not nursed at the breast. The mother remained in bed for two weeks, and was about attending to her household duties in three. An irregular, slightly colored discharge had been present since confinement, and this increased considerably after the sixth week. It was then that examination revealed inversion of the uterus. Eight weeks post-partum, under anæsthesia, a careful effort at manual reduction was made in vain, hemorrhage becoming so profuse that the vagina was packed, and the patient was conveyed to the hospital. Here, an incision was made posteriorly into the pouch of Douglas, and reduction again attempted. This method was unsuccessful. Next, the posterior wall of the uterus was split in the median line, according to the method of Küstner, and reduction once more tried. The organ was by this time so friable, however, that all efforts were unavailing. Accordingly, hysterectomy was performed, the ovaries being removed with the uterus. One ovary was cystic and the other adherent at the neck of the funnel. A small subperitoneal fibroid occupied the entrance to the inversion. The patient collapsed after the operation, and suffered from shock. After four days, improvement began, and recovery took place satisfactorily.

Barbour's case is of interest, in that it shows changes in the muscular wall of the uterus. His patient, aged 37, was a iii-para, two months post-partum. The labor was instrumental, as had been the two previous ones, due, no doubt, to a justo-minor pelvis. The uterus was small and completely inverted. Manual reduction was partially successful, but could not be completed, and, two days later, the organ was again inverted. One week later, the abdomen was opened, both thicknesses of the reflected pelvic wall were incised posteriorly, while pressure, per vaginam, raised the uterus up until reduction had been effected. The organ was found to be in an advanced stage of fatty degeneration, and hence supravaginal hysterectomy was performed. One ovary was also removed. The patient collapsed following the operation, and suffered from shock for twenty-four hours. Convalescence was slow, but she was able to leave the hospital three weeks later. Barbour argues, in conclusion, that this case shows the advantage of the abdominal over the vaginal route, since the condition could have been treated vaginally only with difficulty, and the degenerated condition of the uterus would not have been recognized, and hence not treated by extirpation. — *Journal of Obstetrics and Gynæcology of the British Empire*, vol. x, pp. 360–364, Oct., 1906. CAREY CULBERTSON.

BOOK REVIEWS

GALL-STONES AND THEIR SURGICAL TREATMENT. By B. G. A. Moynihan, M. S. (Lond.), F. R. C. S., Senior Assistant Surgeon to Leeds General Infirmary, Leeds, England. Second edition, revised and enlarged. Octavo, 458 pages; beautifully illustrated. Philadelphia and London: W. B. Saunders & Co. 1905. Cloth, $5 net; half morocco, $6 net.

The first edition of Mr. Moynihan's work on gall-stones was completely exhausted in eight months. Mr. Moynihan, by his masterly presentation of operative technique, and clear, logical discussion of indications and contraindications, has won an enviable place in contemporary abdominal surgery.

This book contains the material upon which Moynihan based a course of lectures delivered at the Medical Graduates College in London during April and May, 1904. It includes a detailed account of the ætiology, pathology, clinical manifestations, and operative treatment of gall-stones.

There can be no doubt that, in the future, surgical treatment will be adopted more frequently and in an earlier stage of gall-stone disease than has hitherto been customary. The great and increasing importance of the subject is therefore a sufficient warrant for the publication of a work of this size.

In this the second edition, increased in size by some seventy pages, many additional case records have been incorporated and a number of new illustrations added. We note also the addition of a very valuable chapter on congenital abnormalities of the gall-bladder and bile-ducts. It is evident that the whole text has undergone a careful revision and all recent work along the line of gall-stone surgery included. Mr. Moynihan's book still holds first place in its field. The illustrations are very artistic, especially the nine colored plates, and the mechanical part of the book-making is very satisfactory. It is gratifying that a book of worth like this one has been so well appreciated by the profession, as shown by the early exhaustion of the large editions.

PATHOLOGIE UND THERAPIE DER FRAUENKRANKHEITEN. By Prof. A. Martin, Director of the University Gynecological Clinic in Griefswald, and Prof. Ph. Jung, Physician-in-Chief in the Griefswald Gynecological Clinic. Fourth edition, revised. 185 illustrations; 524 pages. Berlin and Wien: Urban und Schwarzenberg.

The earlier editions of Martin's Gynecology, which appeared in 1884, 1887, and 1893, have had a large circulation, not only in Germany, but also in other countries, especially France and America. This circulation was due to the same thing that made so popular his lectures in the "Ferien" courses in Berlin, the happy combination of pathology and practical treatment, which makes the work well adapted to general use.

The same clear, precise, but comprehensive treatment of the subject characterizes this edition. A comparison of the third edition with the present shows in an astonishing manner the progress of gynecology in the last 13½ years.

In the treatment of asepsis and disinfection, bacteriological examination, and the infectious diseases, the progress is especially evident. A short chapter is given to gonorrhœa in women, in which a discussion of the origin and clinical manfestation of the disease is followed by a somewhat dubious prognosis and a pessimistic view of the possibilities of prophylaxis. In the treatment of this affection, Martin has come to discard active measures to combat the acute process, to rely chiefly on rest and absolute sexual abstinence, and to avoid operation.

The progress of our knowledge concerning tuberculosis of the female genitalia is also shown in the chapter devoted to this affection. The rich material of the Griefswald Clinic (24 per cent of all purulent adnexa diseases) is made use of. The great difficulties in diagnosis are emphasized, and in the treatment conservatism is recommended.

In the discussion of the inflammations of the vulva, vagina, and uterus, there is likewise some new matter, especially in the discussions of inflammatory affections due to infection. New methods of treatment — for example, atmukaosis — are not particularly commended, and cannot replace the old.

In the chapter on changes in the position and shape of the uterus and vagina, the author can call attention to the fact that his former opposition to the belief in the important influence of the flexions and versions of the uterus is now almost universal. The changes in this chapter are less marked than in most of the others. The discussion of symptoms and diagnosis is little changed, while in the therapy the pessary is still of much value. The various displacement operations are described and

compared, and the reasons for the author's choice of vaginal fixation given. This operation, combined with anterior and posterior colporrhaphy, is also used in cases of prolapse. In the discussion of prolapse and of the perineal operations, many American readers will regret that no notice is taken of the attempts of Harris, Goldspohn, and others to restore the continuity and the function of the torn muscles of the pelvic floor.

In cases of fibromyoma of the uterus, Martin recognizes a non-operative symptomatic treatment for mild cases. Where the health of the woman is threatened, operation is indicated. When myomectomy is possible, Martin favors this operation, preferably by the vaginal route. In other cases the radical operation is done.

The results of the recent investigations in the pathology of uterine cancer are given fully, and the technique of radical abdominal operation well presented, without, however, the author committing himself fully to this method of procedure. Apparently, however, he prefers the abdominal to the vaginal route.

Only a short chapter is given to the urinary-genital fistulæ, and only two pages to the hemorrhoidal and other rectal affections.

Diseases of the tube, ovary, and pelvic connective tisue are treated with the comprehensiveness to be expected from an author who has given us such elaborate books on these subjects. As is well known, Martin prefers the vaginal route in operation on diseased tubes, and advocates, when possible, preservation of the tube. The more recent work on the pelvic connective tissue is presented in a chapter that is one of the most interesting and valuable in the book.

The illustrations are not as elaborate as in some recent books, but they are well chosen and well executed. It is safe to say that the present edition will take quite as high a rank in favor and usefulness as its predecessors. C. S. B.

THE PRACTICE OF PEDIATRICS. By Walter Lester Carr, A. M., M. D. Philadelphia and New York: Lea Brothers and Company. 1906.

This book is one of three companion volumes. One is devoted to gynecology, another to obstetrics, and the third is devoted to pediatrics. The author of the pediatric volume states in the preface that the contributions are from the pens of well-known authors in America and England, and that these authors have kept in mind, first, the clinical picture of the disease, and second, the best methods for its treatment. More space than usual has been allotted to infant-feeding, diseases of the pulmonary tract, the disorders of nutrition, respiration, circulation, and to contagious diseases, the object being to describe the conditions most intimately associated with diseases in children, and not those which are more common in adult life and that are found but rarely in children. In a word, the line between pediatrics and general medicine has been carefully drawn, so that space has thereby been found for the full presentation of the former subject.

The subject of infant-feeding is treated by Thomas S. Southworth. The subject of maternal feeding is presented in a clear and concise manner, and this chapter is a valuable one to physicians and students for reference. The subject of cow's milk and substitute feeding is treated of fully. Every page shows the thought of the author and his wide experience. From the standpoint of infant-feeding as it is practised in America, this contribution is fully up to date.

A notable contribution is that by Clive Reviere on diseases of the respiratory tract. The classifications and clinical descriptions are excellent, and his directions for treatment are minute, prepared with the greatest care, and will prove helpful. The chapter on bronchopneumonia is altogether up to date, and reconciles the varying clinical course with the pathological findings of the disease. The chapter on bronchiectasis and pulmonary fibrosis is written from his own experience, and includes 32 carefully studied cases, and it would be difficult to find a more carefully prepared treatise in any of the recent books devoted to pediatrics.

The diseases of the heart and blood-vessels were assigned to F. J. Boynton of London. He gives a very creditable presentation. His contribution is clearly written, and it begins with the methods of examination and the general considerations of heart disease in childhood, and many points of interest are brought out. In speaking of the cause of heart disease in children, he gives the first place to rheumatism, and he emphasizes the fact that rheumatic fever is more common and more virulent in England than in America, and for this reason is a more important factor in the causation of heart disease in the former country. Among predisposing causes, he considers heredity all-important, for he believes it is a powerful factor in rheumatic disease. Then, too, he mentions the fact that overstrain will damage the hearts of young, anæmic, rapidly growing children. He warns particularly against overstrain during the convalescence from acute infectious diseases, such as influenza and diphtheria, and he refers to underfed and growing lads who ride bicycles as hard as they can or who train for races after a hard day's work. Chorea he considers in most instances as rheumatic in

origin, and not as a complication of the cardiac disorder. The treatment is fully up to date, and the author speaks from his own experience and in no uncertain tone.

There are many other excellent contributions contained in this volume, and it would be impossible to consider them separately. On the whole, the book is one of the best of its kind which has appeared in English in recent years, and credit should be given the editor, co-workers, and publishers for presenting so valuable and readable a publication.

ISAAC A. ABT, M. D.

URIC ACID. The Chemistry, Physiology, and Pathology of Uric Acid and the Physiologically Important Purin Bodies, with a Discussion of the Metabolism in Gout. By Francis H. McCrudden. Pp. 318. Paper, $2.50, net; canvas, $3.00, net. Boston: Samuel Usher. 1905.

The work is from the laboratory of physiological chemistry of the Harvard Medical School. It is a complete and comprehensive review of our knowledge of the physiology and chemistry and pathology of uric acid and its chemical congeners. The research literature is very carefully and exhaustively reviewed and the material carefully arranged. The author presents the experiences and experimental observations of a thoroughly conducted piece of research, and allows the reader to draw his own conclusions. The synthesis of uric acid and the purin bodies, their decomposition products in the body, the effect of drugs on uric acid excretion and on its solubility in the blood and urine, are all carefully presented. The commonly accepted views of Haig are severely criticised, and justly so, for the recent advances in our knowledge have shown that rheumatic diseases and uric acid metabolism are not closely related. In his studies on the metabolism in gout, the author refutes the many theories that have been advanced, and attaches no significance to uric acid, either in the ætiology or pathology of the disease. The book is a valuable contribution to a dark chapter in our knowledge, and will help to clear up many hazy and erroneous ideas that are commonly entertained on the subject of uric acid metabolism.

M. MILTON PORTIS, M. D.

THE MEDICAL DISEASES OF INFANCY AND CHILDHOOD. With points on the anatomy, physiology, and hygiene peculiar to the developing period. By Alfred C. Cotton, A. M., M. D., Professor of Pediatrics, Rush Medical College, University of Chicago.

As the author states in the preface, this book was written at the request of the publishers to prepare a work limited to six hundred pages, comprising all of the medical diseases of infancy and childhood. It is not therefore an exhaustive treatise, intended to take its place beside he standard works on that subject in this country. Points of controversy are omitted, and we have rather a concise, practical treatise, founded largely on the personal experience of a very successful practitioner, clinician, and teacher of pediatrics. The book is up to date, and is to be recommended to the general practitioner who desires a short but reliable and very practical work. It is unusually well illustrated, for the most part by photographs that are original and that differ strikingly from those ordinarily used. Especial emphasis is given to the anatomy of this period, as well as to the physiology and hygiene.

BOOKS RECEIVED

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HOW TO SUPPRESS A MALPRACTICE SUIT, AND OTHER MEDICAL MISCELLANIES. By Thomas Hall Shastid, A. M., M. D., LL. D. Marion, Illinois: Marion Publishing Company. 1906. Price $1.50.

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PRACTICAL MEDICINE SERIES. Comprising ten volumes on the year's progress in medicine and surgery. Under the general editorial charge of G. P. Head, M. D., Professor of Laryngology and Rhinology, Chicago Post-graduate Medical School. Vol. IV — Gynecology. Edited by E. C. Dudley, A. M., M. D., Professor of Gynecology, Northwestern University Medical School, and C. V. Bachellé, M. S., M. D., Gynecologist to the German Hospital, Chicago. Series 1906. Cloth, pp. 227, $1.25. Chicago: The Year Book Publishers.